

Final Report

Chemical Characterization of Sediments within the Southwest Marine Leasehold Areas for Use in Remediation Efforts

Port of Los Angeles, Los Angeles, California

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Appendix B – Field Core Logs and Photos

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ABBREVIATIONS AND ACRONYMS

ASTM American Society for Testing and Materials

CFR Code of Federal Regulations

COC chain of custody

CSTF Contaminated Sediments Task Force

DBT dibutyltin

DGPS Differential Global Positioning System

ER-L effects range-low ER-M effects range-median

GC-ECD gas chromatography-electron capture detection

GC-MS gas chromatography-mass spectrometry

GFAAS graphite furnace atomic absorption spectrophotometry

GIS geographic information system

ICP-MS inductively coupled plasma – mass spectrometry

ID identification

LBNS Long Beach Naval Station

MBT monobutyltin

MDL method detection limit MLLW mean lower low water MRL method reporting limit

NELAC National Environmental Laboratory Accreditation Conference

OTM Ocean Testing Manual POLA Port of Los Angeles

QA/QC quality assurance/quality control RPD relative percent difference SAP sampling and analysis plan

SM Standard Methods

SQO sediment quality objective SOP standard operating procedure

SWM Southwest Marine TTBT tetrabutyltin TBT tributyltin

TOC total organic carbon

TTLC total threshold limit concentration
USACE United States Army Corps of Engineers

USACE-LA United States Army Corps of Engineers, Los Angeles District

USCS Unified Soil Classification System

USEPA United States Environmental Protection Agency

Weston Weston Solutions, Inc.

UNITS OF MEASURE

°C centigrade ft feet or foot

mg/kg milligram per kilogram

mm millimeter

μg/kg microgram per kilogram

1.0 INTRODUCTION

1.1 Background

Southwest Marine (SWM) leased property in the Port of Los Angeles (POLA) from 1981-2005 for the operation of a ship repair, retrofit, and demolition business. Prior to 1981 the property was occupied by Southwest Shipbuilding Company (1918-1921) and Bethlehem Shipbuilding Corporations, Ltd. (1921-1981). The leasehold area is divided into six parcels, and three of these parcels include waterways. Parcel 4 is predominantly covered by water, and contained two large dry docks, while Parcel 5 and 6 are narrow stretches of land along Berths 240X, Y, and Z.

Previous environmental studies have been conducted in the former Southwest Marine leasehold area. Two landside soil borings collected in Parcel 1, adjacent to Parcel 4, demonstrated that lead was elevated (88.7 mg/kg) at only one of the boring sites. In 2002, Southwest Marine collected three sediment samples at the end of Piers 1, 2, and 3 within Parcel 4 and analyzed these samples for arsenic, chromium, copper, nickel, lead, zinc, and total organic carbon (TOC). All metal concentrations were found below concentrations that may cause impacts to benthic organisms or communities, as predicted by Effects Range-Median (ER-M) values (Long et al., 1995). However, this study was not a full-scale investigation of the spatial distribution of metals in and adjacent to the SWM leasehold area. In addition, organic contaminants were not investigated as part of SWM's 2002 investigation. Consequently, the Port requested that Weston Solutions, Inc. (Weston, 2005) evaluate the spatial (horizontal and vertical) distribution of sediment contamination within and adjacent to the SWM leasehold area. Results of this study indicated that there were elevated concentrations of many sediment contaminants within and adjacent to the SWM leasehold area (Weston, 2005). In addition to examining the horizontal distribution of contaminants, data were interpolated using an inverse distance weighted geographic information system (GIS) method, and maps were generated to illustrate the areas that would require remediation based on total threshold limit concentration (TTLC) exceedances, ER-M exceedances, and exceedances of cleanup goals for copper as determined for the Long Beach Naval Station, separately (Weston, 2006). The data interpolation had limited confidence due to the large distances between sediment sampling locations within and adjacent to the SWM leasehold. It was determined that additional sediment sampling and characterization was necessary to obtain higher resolution in the mapping of sediment contaminant distributions and areas and volumes of material requiring remediation using spatial interpolation techniques, to further refine the spatial extent of contamination.

1.2 Objective

The purpose of this study was to further delineate the spatial (horizontal and vertical) distribution of sediment contamination within and adjacent to the SWM leasehold area.

As part of this objective, it was necessary to determine the maximum depth of sediment contamination by taking deeper cores throughout the sampling area. Specifically, to ensure that all of the contaminated sediment was characterized, 20 locations within Parcel 4 were sampled to a target core length of 13 ft. In addition, to collect additional information on the spatial distribution of contaminants, 26 locations offshore of Parcel 4 and along the wharf-face of Parcels 5 and 6 were sampled to a target core length of 15 ft.

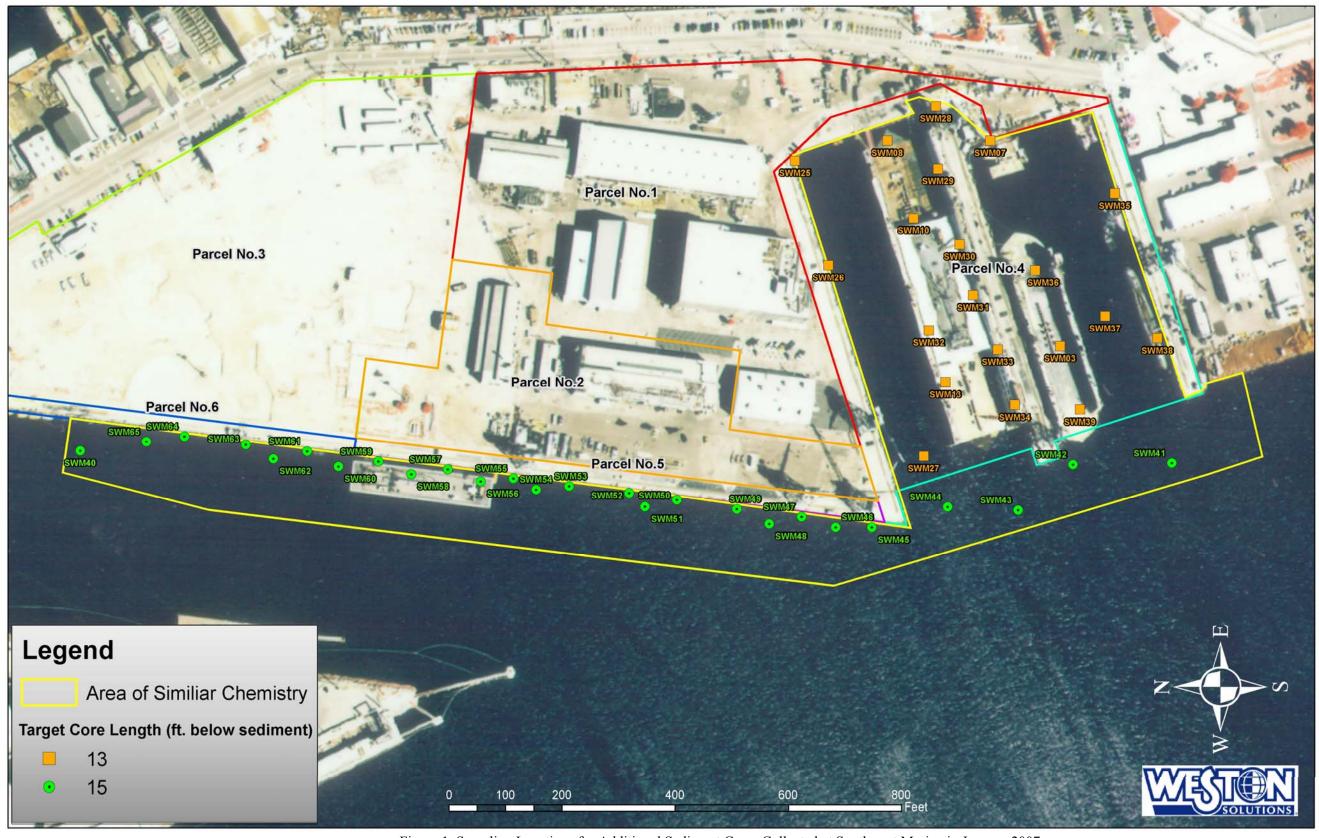


Figure 1. Sampling Locations for Additional Sediment Cores Collected at Southwest Marine in January 2007

2.0 MATERIALS AND METHODS

2.1 Field Collection Program for Sediment Core Samples

2.1.1 Sampling Locations and Depths

Sediment core samples were collected to a depth of 13 ft below the sediment surface at 20 locations within Parcel 4 of the SWM leasehold area and to a depth of 15 ft below the sediment surface at 26 stations located offshore of Parcel 4 and along the wharf-face of Parcels 5 and 6 (Figure 1) unless refusal was encountered. Refusal was defined as less than 2 inches of penetration per minute. If refusal was encountered, the vessel was moved and a second core attempted.

The placement of sample locations was designed to provide high spatial resolution to comprehensively determine the chemical and physical nature of bottom material in the SWM leasehold area. The planned number of cores, station identification (ID), locations, and target lengths are provided in Table 1.

One core per location was sufficient to ensure an adequate volume of material (~ 2 L) for all required testing and archival. The cores were split into vertical segments to assess the vertical resolution of potential chemical contamination. At all stations, cores were segmented into two-foot sections (i.e., 0-2 ft, 2-4 ft, 4-6 ft, etc.) to a depth of 13 or 15 ft below the sediment surface (the bottom segment was only one-foot in length [12-13 ft or 14-15 ft]). Samples from each vertical segment were analyzed separately according to the phased approach presented in the Sampling and Analysis Plan (SAP; Weston 2007) and Section 2.2.1 of this report.

2.1.2 Navigation

For all cores, station locations were pre-plotted using the planned station coordinates listed in Table 1. Vessel positioning was conducted using the M/V Early Bird II's Differential Global Positioning System (DGPS). The system used U.S. Coast Guard differential correction data, and was accurate to ± 10 ft. During field operations, there were no failures of the DGPS system. All final station locations were recorded in the field using coordinates from the DGPS.

2.1.3 Core Collection and Description

Sediment cores were collected using an electric vibracore deployed from the *M/V Early Bird II*, a vessel modified for environmental sampling and owned and operated by Seaventures. The vibracore was equipped with a four-inch outer diameter aluminum barrel and stainless steel cutter head (Figure 2). The standard system was capable of collecting cores up to 20 ft long which was more than sufficient to cover the target sampling depths identified for this project.

Each vibracore sample was brought to the vessel platform, where the sediment sample was extruded from the core barrel onto polyethylene-lined collection trays. Then, each core was examined and logged by a qualified scientist according to the Unified Soil Classification System (USCS) and photographed. The geologic description of each core included the texture, odor, color, length, and approximate grain size distribution, plasticity characteristics of the fine-grained fraction, and any evident stratification of the sediment.

Table 1. Core Locations, Target Lengths, Station ID and Approximate Depths

1 a d 1	e 1. Core Locations, 13	arget Lengths, Station I	D and Approximate D	epins
Station ID	Latitude (WGS 84)	Longitude (WGS 84)	Water Depth (ft.) (approximations for some locations)	Target Core Length (ft.)
SWM03	33° 43.768	-118° 16.210	-36.80	13
SWM07	33° 43.789	-118° 16.138	-25.20*	13
SWM08	33° 43.819	-118° 16.138	-43.30*	13
SWM10	33° 43.811	-118° 16.165	-47.40*	13
SWM13	33° 43.801	-118° 16.222	-36.41	13
SWM25	33° 43.845	-118° 16.145	-26.00*	13
SWM26	33° 43.836	-118° 16.182	-26.38	13
SWM27	33° 43.808	-118° 16.248	-34.52	13
SWM28	33° 43.804	-118° 16.126	-43.30*	13
SWM29	33° 43.804	-118° 16.148	-45.90*	13
SWM30	33° 43.797	-118° 16.174	-47.70*	13
SWM31	33° 43.793	-118° 16.192	-38.00*	13
SWM32	33° 43.806	-118° 16.204	-36.32	13
SWM33	33° 43.786	-118° 16.211	-46.40*	13
SWM34	33° 43.781	-118° 16.230	-46.30*	13
SWM35	33° 43.752	-118° 16.156	-24.50*	13
SWM36	33° 43.775	-118° 16.183	-36.13	13
SWM37	33° 43.755	-118° 16.199	-35.90	13
SWM38	33° 43.740	-118° 16.207	-24.11	13
SWM39	33° 43.762	-118° 16.232	-37.74	13
SWM40	33° 44.054	-118° 16.247	-36.08	15
SWM41	33° 43.735	-118° 16.250	-34.55	15
SWM42	33° 43.764	-118° 16.251	-39.74	15
SWM43	33° 43.780	-118° 16.267	-37.39	15
SWM44	33° 43.801	-118° 16.266	-30.40	15
SWM45	33° 43.823	-118° 16.273	-34.30	15
SWM46	33° 43.833	-118° 16.273	-35.44	15
SWM47	33° 43.843	-118° 16.269	-10.02	15
SWM48	33° 43.853	-118° 16.272	-35.41	15
SWM49	33° 43.862	-118° 16.267	-28.67	15
SWM50	33° 43.880	-118° 16.264	-26.50*	15
SWM51	33° 43.889	-118° 16.266	-33.11	15
SWM52	33° 43.894	-118° 16.261	-22.82	15
SWM53	33° 43.911	-118° 16.259	-27.80*	15
SWM54	33° 43.921	-118° 16.260	-32.45	15
SWM55	33° 43.927	-118° 16.256	-32.38	15
SWM56	33° 43.937	-118° 16.257	-32.42	15
SWM57	33° 43.946	-118° 16.257	-30.60*	15
SWM58	33° 43.957	-118° 16.255	-32.60	15
SWM59	33° 43.967	-118° 16.250	-32.88	15
SWM60	33° 43.978	-118° 16.250	-32.95	15
SWM61				
	33° 43.987	-118° 16.247	-33.61	15 15
SWM62	33° 43.997	-118° 16.250	-34.17	15 15
SWM63	33° 44.005	-118° 16.245	-30.46	15
SWM64	33° 44.023	-118° 16.242	-25.28	15
SWM65	33° 44.034	-118° 16.244	-34.58	15

^{*} Water depth was not available prior to sampling for specific stations, therefore, actual water depths obtained in the field are reported here.

2.1.4 Decontamination of Equipment

All vibracore equipment was cleaned prior to sampling. Between stations, core barrels and the deck of the vessel were rinsed with site water. Plastic liners were rinsed between sample locations within an area and a new plastic liner was used for each area. Before creating each composite, all stainless steel utensils (stainless steel bowls, spoons, spatulas, mixers, and other utensils) were cleaned with soapy water, rinsed with tap water, and then rinsed three times with deionized water.

2.1.5 Sample Processing and Storage

Each core segment was processed on-site on the sampling vessel. Each two-foot core segment was homogenized to a uniform consistency using a stainless steel mixing apparatus. Sediment from each core segment was then placed into two certified-clean 250 ml glass jars with Teflon-lined lids for chemical analysis (one jar for chemical analysis and one jar for archive), and two plastic bags for physical analysis (one bag for grain size and one bag for TOC) Core segments not immediately analyzed in Phase I were archived frozen in the event that further delineation of chemical contamination was required (see discussion on the phased approach to analysis in Section 2.2.1).

Samples were labeled, placed on ice, and shielded from light until delivered to Weston's laboratory in Carlsbad. Any sediment not immediately analyzed was kept frozen at -20°C at Weston until chemical and geotechnical characterization were complete.

2.1.6 Shipping

Prior to shipping, sample containers were placed in sealable plastic bags and securely packed inside the cooler with ice. Chain of custody (COC) forms were filled out as described in Section 2.1.7, and the original signed COC forms were placed in a sealable plastic bag and placed inside the cooler. The cooler lids were securely taped shut. Samples were delivered to the analytical laboratories for analysis. The laboratories, particular analyses to be performed by each, and the point of contact and relevant shipping information for each laboratory are listed in Table 2.

Table 2. Analytical Laboratories, Points of Contact, and Shipping Information

Laboratory	Analyses Performed	Point of Contact	Shipping Information
Weston Solutions, Inc. Carlsbad, CA	Grain size	Dr. David Moore and Ms. Sheila Holt (760) 931-8081	Weston Solutions, Inc. 2433 Impala Dr. Carlsbad, CA 92010
Calscience Environmental Laboratories, Inc.	Sediment chemistry (metals, organochlorine pesticides, organotins)	Mr. Robert Stearns (714) 895-5494	Calscience Environmental Laboratories, Inc. 7440 Lincoln Way Garden Grove, CA 92841
Applied Marine Sciences	TOC	Mr. Ken Davis (281) 554-7272	Applied Marine Sciences 502 N. Hwy 3, Suite B League City, TX 77573

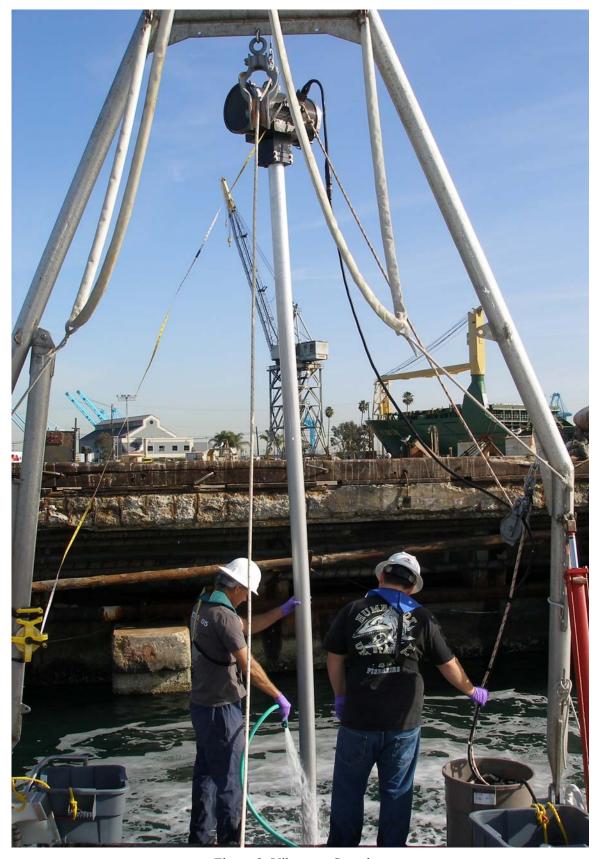


Figure 2. Vibracore Sampler

2.1.7 Documentation and Chain-of-Custody

Samples were considered to be in custody if they were: (1) in the custodian's possession or view, (2) retained in a secured place (under lock) with restricted access, or (3) placed in a secured container. The principal documents used to identify samples and to document possession were COC records, field log books, and field tracking forms. COC procedures were used for all samples throughout the collection, transport, and analytical process, and for all data and data documentation, whether in hard copy or electronic format.

COC procedures were initiated during sample collection. A COC record was provided with each sample or sample group. An example of a COC form is provided in Appendix A. Each person who has custody of the samples signed the form and ensure that the samples were not left unattended unless properly secured. Minimum documentation of sample handling and custody included the following:

- Sample identification
- Sample collection date and time
- Any special notations on sample characteristics
- Initials of the person collecting the sample
- Date the sample was sent to the laboratory
- Shipping company and waybill information

The completed COC form was placed in a sealable plastic envelope within the ice chest containing the listed samples. The COC form was signed by the person transferring custody of the samples. The condition of the samples was recorded by the receiver.

2.2 Physical and Chemical Analyses

2.2.1 Phased Analytical Approach

Physical and chemical analyses were performed according to the phased approach depicted in Table 3. The first phase consisted of analyzing the 0-2 ft (surface) and 4-6 ft core segments with the exception of sample locations previously analyzed. For those locations (SWM3/3B, SWM7, SWM8, SWM10 and SWM13), a slightly modified Phase I approach was used. The second phase consisted of two separate scenarios. In the first scenario (Phase IIa), core segment 2-4 ft was analyzed if sediment contaminant concentrations exceeded the Effects Range-Median¹ (ER-M) values (developed by Long et al., 1995) or exceeded 100 µg/kg TBT in the 0-2 ft core segment, but not in the 4-6 ft core segment. In the second scenario (Phase IIb), core segment 6-8 ft was analyzed if sediment chemistry exceeded ER-M values or TBT concentrations in the 4-6 ft core segment, with the exception of SWM3/3B and SWM13. For area SWM3/3B, the 12-13 ft core segment was analyzed if the 8-10 ft core segment demonstrated elevated sediment chemistry values. For area SWM13, the 12-13 ft core segment was analyzed if the 6-8 ft core segment demonstrated elevated sediment chemistry values. No additional core segments were analyzed if both the 0-2 ft and 4-6 ft core segments were below ER-M values or below 100 µg/kg TBT. Results from the 2005 sediment characterization study were also referenced and used in the decision process when proceeding from Phase I to Phase II. A third phase was implemented if results from Phase IIb still exceeded sediment quality objectives. In Phase III, the 8-10 ft and core segment was analyzed and depending on the target length of the core, either the 12-13 ft core segment (for 13 ft cores) or the 14-15 ft core segment (for 15 ft cores) was analyzed. In Phase III, SWM3/3B could not have any additional analyses and SWM13 could only be analyzed for the 8-10 ft core segment.

¹ See discussion in Section 2.2.5

Core Segment (feet)	SWM3/3B	SWM7	SWM8	SWM10	SWM13	All Other SWM Samples
0 - 2						
2 - 4						
4 – 6						
6 – 8						
8 – 10						
10 - 12						
12 – 13						
			For 15 ft cores			
12 – 14	NA	NA	NA	NA	NA	
14 – 15	NA	NA	NA	NA	NA	

Table 3. Phased Approach to Physical and Chemical Analyses for Individual Core Segments

	Previously analyzed (2005)
Phase I	Initial analyses
Phase IIa	If exceedances of ER-M or TBT values in 0-2 ft segment and not in 4-6 ft segment
Phase IIb	If exceedances of ER-M or TBT values in 4-6 ft segment (or 8-10 ft for SWM3/3B and 6-8 ft for SWM13)
Phase III	If necessary, after consultation
	Archived

NA Not Applicable

Utilizing this approach, 35 samples within Parcel 4 and 52 samples offshore of Parcel 4 and along Parcel 5 and 6 wharf faces were analyzed as part of Phase I. An additional 37 samples were analyzed in Phase II and an additional 15 samples were analyzed in Phase III.

Physical and chemical analytes measured in this testing program were selected to provide data on potential chemicals of concern in POLA sediments. All analytical methods used to obtain contaminant concentrations follow the United States Environmental Protection Agency (USEPA), American Society for Testing and Materials (ASTM), or Standard Methods (SM). In addition, chemical and physical measures selected for this evaluation are consistent with those recommended for assessing dredged material in Los Angeles (USEPA/USACE, 1991; USEPA Region IX/USACE-LA, 1993). The specific analytes and target detection limits were listed in Weston's sampling and analysis plan (SAP; Weston, 2007).

2.2.2 Physical Analyses

Grain size was analyzed to determine the general size classes that make up the sediment (e.g., gravel, sand, silt, and clay). The frequency distribution of the size ranges (reported in millimeters [mm]) of the sediment will be reported in the final data report. Grain size analysis was conducted using the gravimetric procedure described in Plumb (1981).

2.2.3 General Chemistry

TOC, made up of volatile and nonvolatile organic compounds, was performed as recommended in the Ocean Testing Manual (OTM; USEPA/USACE, 1991) using USEPA method 9060A. This procedure (the Lloyd Kahn Method) involved dissolving inorganic carbon (carbonates and bicarbonates) with hydrochloric acid or sulfuric acid prior to TOC analysis (USEPA Region II, 1988).

2.2.4 Sediment Chemistry

Sediment samples were analyzed for priority pollutants and included metals, organochlorine pesticides and organotins. All analytical methods used to obtain contaminant concentrations follow USEPA or SM procedures. The analysis for priority pollutant metals (with the exception of mercury) was conducted using an inductively coupled plasma emissions spectrometry – mass spectrometry (ICP-MS), in accordance with USEPA Method 6020m. Mercury was analyzed using USEPA Method 7471A using graphite furnace atomic absorption spectrophotometry (GFAAS). Organochlorine pesticides were analyzed using gas chromatography with electron capture detection (GC/ECD) using USEPA Method 8081A. The analytical method used to determine tributyltin (TBT) involves methylene chloride extraction, followed by Grignard derivatization and analyzed by gas chromatography with mass spectrometry (GC/MS; Krone et al., 1989). Target detection limits were listed in the SAP (Weston, 2007a).

2.2.5 Comparison of Results to ER-L and ER-M Values and Other Benchmarks

Sediment chemical concentrations in this study were compared to effects range-low (ER-L) and effects range-median (ER-M) values (Long et al., 1995), and regulatory levels, or TTLCs. The effects range values are helpful in assessing the potential significance of elevated sediment-associated contaminants of concern, in conjunction with biological analyses. Briefly, these values were developed from a large data set where results of both benthic organism effects (e.g., toxicity tests, benthic assessments) and chemical concentrations were available for individual samples. To derive these guidelines, the chemical values for paired data demonstrating benthic impairment were sorted according to ascending chemical concentration. The 10th percentile of this rank order distribution was identified as the ER-L and the 50th percentile as the ER-M. While these values are useful for identifying elevated sediment-associated contaminants, they should not be used to infer causality because of the inherent variability and uncertainty of the approach. The ER-L and ER-M sediment quality values are used in conjunction with bioassay testing and are included for comparative purposes only. TTLCs indicate the level above which material must be managed as hazardous waste upon removal, in accordance with the Title 40 Code of Federal Regulations (CFR) part 261 and Title 22 of the California Code of Regulations.

Copper concentrations were also compared to a target cleanup level of 254 mg/kg. This value is based on recommendations by the Contaminated Sediments Task Force (CSTF) Advisory Committee for channel deepening projects near Berths 48-52 in the POLA. The CSTF decided this target cleanup level was more appropriate than the ER-M value (270 mg/kg) based on the following: (1) ER-M values are derived from a nationwide database and may not be relevant to specific sites, (2) local studies suggest bioaccumulation of copper occur at concentrations below 270 mg/kg, and (3) a site-specific study conducted by the Navy at the Long Beach Naval Station (LBNS) determined a cleanup level of 254 mg/kg was more appropriate (i.e., if using an apparent effects thresholds sediment toxicity approach).

Currently there are no sediment quality objectives, guidelines, or target cleanup levels for tributyltin. However, an extensive literature review conducted by Weston (2007b), concentrations of 100 μ g/kg TBT or greater in sediment have the potential to cause toxicity to aquatic organisms. Based on these studies, 100 μ g/kg was used as a guideline in our phased analytical approach (section 2.2.1), and in describing the analytical results below.

2.3 Quality Assurance Procedures

Weston's quality assurance/quality control (QA/QC) staff performs periodic audits to ensure that test conditions, data collection, and test procedures are conducted in accordance with Weston Solutions' standard operating procedures (SOPs). Weston's SOPs have been audited and approved by an independent USEPA-approved laboratory and placed in the QA file as well as laboratory files.

2.3.1 Field Collection and Sample Handling

All relevant project and sample information and field measurements were recorded on customized water-proof core log data forms. A daily field log was maintained, and formal chain-of-custody procedures were followed and documented. The DGPS system was verified daily by comparing accuracy with known landmarks. All sampling equipment was cleaned between sample stations. Samples were double-bagged, and both inner and outer bags labeled. Samples were held on ice until transport to Weston in Carlsbad, California. COC forms were prepared in the field during sediment collection by Weston personnel. Once sediments were composited, a new COC was prepared for the transfer of sediments for physical, chemical and biological analyses.

2.3.2 Chemical and Physical Analyses

Chemical analyses were performed using QC criteria specified in Methods for Chemical Analysis of Water and Wastes (USEPA, 1983) and Test Methods for Evaluating Solid Waste (SW-846) (USEPA, 2004a), in a California state-certified laboratory (California ELAP Certification #2261). TOC analyses were performed in accordance with QA procedures outlined by EPA (USEPA, 2004b), ASTM (2005), the 2006 Department of Defense Quality Systems Manual for Environmental Laboratories (Version 3; DoD, 2006) and the 2003 National Environmental Laboratory Accreditation Conference Standard (NELAC, 2004) in a Texas state-certified and nationally-accredited laboratory (NELAP Certificate #E87956). Grain size analyses, performed by Weston, were consistent with internal QC criteria. Performance objectives were evaluated via the use of standard reference materials, or laboratory control samples, method blanks, surrogates, spiked samples, duplicate samples, and internal QC samples. Precision and accuracy objectives were established for method reporting limits (MRLs), spike recoveries, and duplicate analyses.

3.0 RESULTS

3.1 Sediment Sample Collection and Handling

Vibracore sampling was conducted January 8 - 13, 2007. The weather was overcast, with light winds and calm seas in the mornings, and partial clouds with moderate to strong winds and mildly choppy seas in the afternoon.

Field coordinates, depth of penetration relative to the mudline (i.e., the sediment surface), depth of recovery relative to the mudline, and core length retained for each station location are summarized in Table 4.

The actual length of the cores differs from the target lengths because of differences in the actual bathymetry and the historical bathymetry used to calculate target core lengths. Field core logs, core photos, and other associated documentation for the sampling effort are provided in Appendix B.

Table 4. Field Coordinates and Sampling Depths of Sediment Core Samples

Station ID	Attempt	Latitude (WGS 84)	Longitude (WGS 84)	Water Depth (MLLW [ft])	Target Core Length (ft)	Penetration (ft)	Final Core Length (ft)	Final Core Length Kept for Analysis (ft)	Comments
SWM03	1	33°43.772'	118°16.215'	-40.3	13.0	13.0	7.0	7.0	Recovery insufficient.
SWM03	2	33°43.772'	118°16.214'	-40.3	13.0	13.0	13.0	13.0	
SWM07	1	33°43.790'	118°16.146'	-27.7	13.0	14.0	13.0	13.0	
SWM08	1	33°43.814'	118°16.138'	-45.2	13.0	14.0	14.0	13.0	
SWM10	1	33°43.823'	118°16.165'	-49.4	13.0	12.0	10.0	10.0	Recovery insufficient.
SWM10	2	33°43.823'	118°16.166'	-49.8	13.0	14.0	12.0	12.0	
SWM13	1	33°43.792'	118°16.217'	-47.4	13.0	13.0	13.0	13.0	
SWM25	1	33°43.837'	118°16.146'	-27.3	13.0	14.0	12.0	12.0	
SWM26	1	33°43.835'	118°16.183'	-25.6	13.0	14.0	13.0	13.0	
SWM27	1	33°43.813'	118°16.250'	-31.5	13.0	5.0	5.0	5.0	Refusal at 5 feet, debris
SWM27	2	33°43.814'	118°16.252'	-31.2	13.0	14.0	14.0	13.0	
SWM28	1	33°43.809'	118°16.138'	-45.5	13.0	14.0	12.0	12.0	Refusal at 12 feet.
SWM29	1	33°43.808'	118°16.148'	-47.6	13.0	14.0	13.0	13.0	
SWM30	1	33°43.799'	118°16.176'	-49.2	13.0	14.0	11.0	11.0	Refusal at 12 feet.
SWM31	1	33°43.794'	118°16.192'	-39.3	13.0	14.0	11.5	11.5	Refusal at 12 feet.
SWM32	1	33°43.798'	118°16.203'	-49.0	13.0	14.0	13.0	13.0	
SWM33	1	33°43.788'	118°16.218'	-48.6	13.0	14.0	13.0	13.0	
SWM34	1	33°43.783'	118°16.230'	-49.0	13.0	14.0	13.0	13.0	
SWM35	1	33°43.752'	118°16.158'	-27.0	13.0	13.0	13.0	13.0	
SWM36	1	33°43.780'	118°16.189'	-39.0	13.0	13.0	10.5	10.5	No analysis beyond 10.5
SWM37	1	33°43.752'	118°16.203'	-34.8	13.0	5.0	1.5	1.5	Refusal at 5 feet, debris
SWM37	2	33°43.752'	118°16.203'	-35.6	13.0	10.5	7.0	7.0	Refusal at 10.5 feet, debris
SWM38	1	33°43.739'	118°16.210'	-26.0	13.0	13.5	13.0	13.0	
SWM39	1	33°43.769'	118°16.231'	-39.0	13.0	8.0	8.0	8.0	Refusal at 6 feet.
SWM39	2	33°43.769'	118°16.231'	-39.9	13.0	13.5	13.0	13.0	
SWM40	1	33°44.056′	118°16.250'	-37.7	15.0	16.0	15.0	15.0	

Station ID	Attempt	Latitude (WGS 84)	Longitude (WGS 84)	Water Depth (MLLW [ft])	Target Core Length (ft)	Penetration (ft)	Final Core Length (ft)	Final Core Length Kept for Analysis (ft)	Comments
SWM41	1	33°43.740'	118°16.254'	-44.6	15.0	16.0	16.0	15.0	
SWM42	1	33°43.768'	118°16.258'	-41.8	15.0	15.0	13.0	13.0	Refusal at 13 feet.
SWM43	1	33°43.776'	118°16.263'	-46.0	15.0	15.0	15.0	15.0	
SWM44	1	33°43.803'	118°16.255'	-39.9	15.0	15.5	15.5	15.0	Vibracore tube broke, boat shifted.
SWM45	1	33°43.819'	118°16.280	-38.2	15.0	15.5	15.0	15.0	
SWM46	1	33°43.825'	118°16.277'	-41.0	15.0	15.5	15.0	15.0	
SWM47	1	33°43.846'	118°16.275'	-31.5	15.0	15.0	14.0	14.0	
SWM48	1	33°43.854'	118°16.278	-33.4	15.0	15.5	15.5	15.0	
SWM49	1	33°43.860'	118°16.242'	-29.9	15.0	16.0	15.5	15.0	
SWM50	1	33°43.876'	118°16.269'	-29.3	15.0	15.0	15.0	15.0	
SWM51	1	33°43.881'	118°16.271	-31.5	15.0	15.0	14.0	14.0	
SWM52	1	33°43.892'	118°16.266'	-29.9	15.0	15.0	15.0	15.0	
SWM53	1	33°43.910'	118°16.265'	-29.8	15.0	13.0	13.0	13.0	Shell hash at 13 feet.
SWM54	1	33°43.923'	118°16.261'	-29.2	15.0	-	-	-	Refusal at 4 feet rocks.
SWM54	2	33°43.922'	118°16.265'	-32.2	15.0	15.5	15.5	15.0	
SWM55	1	33°43.930'	118°16.261'	-29.9	15.0	2.0	-	-	Refusal at 1 foot rocks.
SWM55	2	33°43.930'	118°16.261'	-32.8	15.0	-	-	-	Refusal at 1 foot rocks.
SWM55	3	33°43.932'	118°16.268'	-37.6	15.0	15.0	15.0	15.0	
SWM56	1	33°43.941'	118°16.262'	-34.6	15.0	15.5	15.5	15.0	
SWM57	1	33°43.949'	118°16.258'	-32.8	15.0	15.5	15.5	15.0	
SWM58	1	33°43.960'	118°16.263'	-36.7	15.0	15.0	15.0	15.0	
SWM59	1	33°43.968'	118°16.258'	-36.0	15.0	16.0	16.0	15.0	
SWM60	1	33°43.981'	118°16.258'	-36.8	15.0	15.0	15.0	15.0	
SWM61	1	33°43.982'	118°16.255'	-33.0	15.0	15.0	15.0	15.0	
SWM62	1	33°43.997'	118°16.255'	-32.5	15.0	15.0	15.0	15.0	
SWM63	1	33°44.006'	118°16.250'	-33.6	15.0	15.0	15.0	15.0	
SWM64	1	33°44.029'	118°16.254'	-38.0	15.0	11.0	11.0	11.0	Refusal at 11 feet.
SWM64	2	33°44.027'	118°16.255'	-37.0	15.0	14.0	12.5	12.5	Refusal at 14 feet. Clumps of red, paint like material found throughout core.
SWM65	1	33°44.039'	118°16.253'	-38.3	15.0	16.0	16.0	15.0	

3.2 Results of Physical and Chemical Analyses

3.2.1 Physical and Chemical Characteristics

Results of physical and chemical analyses for project sediment composites are presented in Table 5 through Table 8. All results are expressed in dry weight unless otherwise indicated. Target detection limits were provided in the SAP (Weston, 2007). The actual detection limits and raw data for the analyses are provided in Appendix C.

3.2.1.1 Within Parcel 4

Twenty stations (SWM03, SWM07, SWM08, SWM10, SWM13, and SWM25 – SWM39) were located within Parcel 4. Phase I (depth layers 0-2 ft and 4-6 ft) analysis was conducted on all 20 stations. At four stations (SWM07, SWM25, SWM27 and SWM32), Phase II and Phase III analyses were not required. At five stations (SWM08, SWM26, SWM28, SWM29 and SWM38), Phase IIa analysis (2-4 ft depth interval) was conducted. At eleven stations (SWM03, SWM10, SWM13, SWM30, SWM31, SWM33 - SWM37 and SWM39), Phase IIb analysis (6-8 ft depth interval except at SWM03 and SWM13, which had the 12-13 ft analyzed) was conducted. At four stations (SWM33, SWM34, SWM 36 and SWM39), Phase III analysis was required for one or more groups of analytes. The 6-8 ft depth interval at SWM28 was also analyzed in Phase III to further delineate elevated levels of TBT.

Grain Size and TOC

The majority of the samples collected within Parcel 4 (75%) consisted of predominantly coarse-grained material ranging from 52.1% to 98.2% gravelly sand. The remaining 25% of samples consisted primarily of fine-grained material ranging from 52.6% to 89.1% silts and clays. TOC ranged in concentration from 0.03% at multiple stations to 4.2% at SWM31/0-2 ft.

Metals

At eight stations (SWM07, SWM08, SWM26, SWM27, SWM29, SWM34, SWM35 and SWM37), metals concentrations were generally low with at most one metal exceeding an ER-M value at a specific depth interval at a station. At SWM26, zinc was the only metal to exceed its ER-M value (410 mg/kg) with a concentration of 700 mg/kg in the duplicate sample. At SWM29, mercury exceeded its ER-M (0.71 mg/kg) in the 0-2 ft and 2-4 ft depth intervals with concentrations of 0.84 mg/kg and 1.94 mg/kg, respectively. Mercury also exceeded its ER-M value at SWM37 with a concentration of 0.98 mg/kg in the 4-6 ft depth interval. Copper was the only metal to exceed its ER-M value (270 mg/kg) at SWM34/4-6 ft with a concentration of 641 mg/kg.

In contrast, three stations (SWM03, SWM10 and SWM38) had multiple metals exceeding in a single depth layer and nine stations (SWM13, SWM25, SWM28, SWM30 – SWM33, SWM36 and SWM39) had multiple metals exceeding ER-M values (or in the case of SWM13 exceeding the TTLCs) at several depth layers. At SWM13, copper and zinc both exceeded their TTLCs (2,500 mg/kg and 5,000 mg/kg, respectively) with concentrations of maximum observed concentrations of 3,490 mg/kg and 5,150 mg/kg, respectively. The maximum concentrations of lead and mercury both occurred at SWM36, with values of 720 mg/kg and 12.7 mg/kg in the 6-8 ft and 4-6 ft depth intervals, respectively. With the exception of SWM13/12-13 ft, metals concentrations in the deepest sediment layer analyzed at each station within Parcel 4 were below ER-M values. A summary of the frequency of stations exceeding sediment quality guidelines and TTLCs is provided in Table 9.

Table 5. Summary of Physical Measurements and Chemistry Analytical Results for the area within Parcel 4, Southwest Marine Leasehold, Port of Los Angeles with a Comparison to Sediment Quality Values

	1						Within	Parcel 4					Within	Parcel 4					Within	Parcel 4	
		LBNS			Phase I	Phase II	Phase I	Phase II	Phase II	Phase I	Phase I	Phase II	Phase I	Phase II	Phase I	Phase I	Phase II	Phase I	Phase I	Phase II	Phase
Analyte	ERL	(Copper	ERM	TTLC	SWM03	SWM03	SWM07	SWM08	SWM08	SWM08	SWM10	SWM10	SWM13	SWM13	SWM25	SWM25	SWM25	SWM26	SWM26	SWM26	SWM2
		only)			8-10 ft	12-13 ft	4-6 ft		2-4 ft DUP		4-6 ft	6-8 ft	6-8 ft	12-13 ft	0-2 ft	4-6 ft	6-8 ft	4	0-2 ft DUP		4-6 ft
ain Size (%)		ı		ı				ı			II.		u		u						
Gravel	Τ.		_	_	0.53	1.88	5.03	8.52		10.41	1.08	5.29	1.78	1.45	1.87	1.28	0.40	0.74		0.91	1.51
Sand	-			_	37.72	94.78	41.09	78.10		87.37	76.70	80.60	79.10	90.10	91.90	50.81	97.54	96.52		91.14	95.75
Silt			-									t	11	1				11			1
	-		-	-	32.10	1.93	31.75	9.71		0.65	12.66	9.96	8.32	4.76	3.51	32.63	0.77	1.04		3.45	1.18
Clay	-		-	-	29.65	1.41	22.13	3.67		1.56	9.56	4.15	10.81	3.69	2.72	15.28	1.28	1.69		4.50	1.56
eneral Chemistry	1		ı	1	1		1	1			1		П	ı	П	1	1	1			
TOC (%)	-		-	-	2.12	0.04	1.08	0.06		0.03	0.80	0.07	0.54	1.24	0.28	0.34	0.22	0.12		0.23	0.04
letals (mg/kg)					_																
Arsenic	8.2		<u>70</u>	<u>500</u>	27.3	2.22	11.4	3.73	3.95	2.49	11.8	5.49	<u>170</u>	25.5	10.6	4.52	2.04	3.95	4.41	13.9	3.98
Cadmium	1.2		<u>9.6</u>	<u>100</u>	1.45	<0.123	0.34	<0.127	<0.125	<0.122	0.73	<0.123	6.91	1.37	0.54	0.13	<0.120	<0.128	0.23	<0.476	<0.12
Chromium	81		<u>370</u>	<u>2500</u>	176B	7.25	37.0B	76.9	92.6	32.7B	66.4B	18	88.1B	<u>476</u>	91.9B	18.1B	5.26	15.9B	10.4	37.3	9.35E
Copper	34	254	<u>270</u>	<u>2500</u>	<u>1970</u>	10.8	61.8	50.1	42.9	35.7	<u>388</u>	17.9	<u>3490</u>	<u>1480</u>	<u>354</u>	41.1	3.6	40.7	47.2	91.6	40
Lead	46.7		<u>218</u>	<u>1000</u>	<u>383</u>	3.46	19	9.53	10	6.29	170	4.62	<u>693</u>	<u>420</u>	<u>342</u>	43.3B	1.7	49.1	28.9	42.3	10.6E
Mercury	0.15		<u>0.71</u>	<u>20</u>	7.83	0.0958	0.22	0.0705	0.092	0.03	<u>2.01</u>	0.0468	0.24	0.191	<u>2.86</u>	<u>1.19</u>	0.0378	0.61	0.21	0.348	0.1
Nickel	20.9		<u>51.6</u>	<u>2000</u>	31.1	4.62	27.3	5.85	5.98	4.09	17.3	12.8	12.3	18.7	12.2	9.95	3.68	6.83	6.46	22.5	6.61
Silver	1		<u>3.7</u>	<u>500</u>	0.62	<0.123	<0.159	<0.127	<0.125	<0.122	0.42	<0.123	0.6	0.277	0.14	<0.125	<0.120	<0.128	<0.128	<0.476	<0.12
Zinc	150		<u>410</u>	<u>5000</u>	<u>671</u>	21.2	99.4	75.2	67.1	49.7	390	42.7	<u>3990</u>	<u>5150</u>	<u>719</u>	314	15.9	125	<u>700</u>	219	61.5
rganochlorine Pesticides (μg/kg)																				
2,4'-DDD	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
2,4'-DDE	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
2,4'-DDT	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
4,4'-DDD	2		<u>20</u>	<u>1000</u>	<1.7	<1.2	<1.6	3.5	2.9	<1.2	<1.4	<1.2	<1.3	<u>35</u>	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
4,4'-DDE	2.2		<u>27</u>	<u>1000</u>	<u>170</u>	3.4	<1.6	1.8	3.8	1.7	<u>72</u>	1.4	<u>42</u>	44	27	6.4	<1.2	5.3	4.6	<u>50</u>	2.2
4,4'-DDT	1		<u>7</u>	<u>1000</u>	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Total DDTs	1.58		<u>46.1</u>	<u>1000</u>	<u>170</u>	3.4	0	5.3	6.7	1.7	<u>72</u>	1.4	42	<u>79</u>	27	6.4	0	5.3	4.6	<u>50</u>	2.2
Aldrin	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Alpha-BHC	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Beta-BHC	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Chlordane	0.5		<u>6</u>	<u>2500</u>	<u><17</u>	<u><12</u>	<u><16</u>	<u><13</u>	<u><12</u>	<u><12</u>	<u><14</u>	<u><12</u>	<u><13</u>	<u><13</u>	<u><12</u>	<u><12</u>	<u><12</u>	<u><13</u>	<u><13</u>	<u><48</u>	<u><12</u>
Delta-BHC	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Dieldrin	0.02		<u>8</u>	<u>8000</u>	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<u>31</u>	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endosulfan I	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endosulfan II	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endosulfan Sulfate	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endrin	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endrin Aldehyde	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Endrin Ketone	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Gamma-BHC	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Heptachlor	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Heptachlor Epoxide	-		-	-	<1.7	<1.2	<1.6	<1.3	<1.2	<1.2	<1.4	<1.2	<1.3	<1.3	<1.2	<1.2	<1.2	<1.3	<1.3	<4.8	<1.2
Methoxychlor	-	+	-	-	<1.7 <34	<1.2	<1.6 <32	<1.3 <25	<1.2	<1.2	<1.4 <28	<1.2 <25	<1.3 <27	<1.3 <25	<1.2	<1.2 <25	<1.2	<1.3 <26	<1.3	<4.8	<1.2
Toxaphene			-	-	<34	<25	<32	<25	<25	<24	<28	<25	<21	<25	<25	<25	<24	<20	<26	<95	<25
Organotins (µg/kg)	1	1					1	T	1	1	Π			1		I		0	1		T
Dibutyltin	-		-	-	<5.2	<3.7	<4.8	7.1	6.2	75	440	4.6	1000	1200	77	18	<3.7	30	10	100	<3.8
Monobutyltin	-		-	-	<5.2	<3.7	<4.8	<3.8	<3.8	<3.7	26	<3.8	53	<77	<3.8	<3.8	<3.7	<3.8	<3.8	<14	<3.8
Tetrabutyltin	-		-	-	<5.2	<3.7	<4.8	<3.8	<3.8	<3.7	14	<3.8	22	<77	<3.8	<3.8	<3.7	<3.8	<3.8	<14	<3.8
Tributyltin	-		-	•	17	9	8.9	55	84	27	850	8.2	1800	3300	120	34	3.2	50	20	160	18

Table 5. Continued

						Within Parcel 4 Within Parcel 4														
		LBNS			Phase I	Phase I	Phase I	Phase II	Phase I	Phase III	Phase I	Phase II	Phase I	Phase I	Phase I	Phase I	Phase II	Phase I	Phase I	Phase II
Analyte	ERL	(Copper	ERM	TTLC	SWM27	SWM27	SWM28	SWM28	SWM28	SWM28	SWM29	SWM29	SWM29	SWM29	SWM30	SWM30	SWM30	SWM31	SWM31	SWM31
ŕ		only)			0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	6-8 ft	0-2 ft	2-4 ft	4-6 ft	4-6 ft DUP	0-2 ft	4-6 ft	6-8 ft	0-2 ft	4-6 ft	6-8 ft
Grain Size (%)					02.10		0211	2 110		00.1	02.0			1011201	V Z IX	1011	0011	0211	1010	00.0
Gravel		1		l <u>-</u>	3.36	6.41	1.69	0.32	3.44	2.36	0.00	0.15	4.67		8.45	5.80	1.04	11.20	1.22	0.36
	-	1	-	<u> </u>																
Sand	-		-	-	92.43	91.17	27.43	83.61	93.23	95.86	95.05	80.10	91.19		17.40	41.63	65.51	12.28	35.11	97.39
Silt	-		-	-	2.17	0.51	30.61	7.53	1.03	0.51	2.41	11.45	2.14		36.86	29.02	18.81	38.04	29.99	0.53
Clay	-		-	-	2.03	1.91	40.27	8.54	2.30	1.27	2.54	8.30	2.01		37.30	23.55	14.64	38.48	33.68	1.72
General Chemistry	•		1			1			_		1		T					1		
TOC (%)	-		-	-	0.12	0.04	2.93	0.24	0.12	1.02	0.08	1.12	0.05		3.06	2.62	0.08	4.15	2.49	0.04
Metals (mg/kg)																				
Arsenic	8.2		70	<u>500</u>	4.47	2.93	58.5	10.4	4.38		3.26	10.1	2.58	2.84	32.2	35.7	7.59	25.4	22.3	2.05
Cadmium	1.2		9.6	100	0.15	<0.123	1.8	0.369	<0.122		<0.127	0.411	<0.120	<0.119	1.21	1.67	0.287	0.96	1.25	<0.123
Chromium	81		370	<u>2500</u>	17.6B	6.51B	127B	24.8	7.68B		9.76B	36.2	8.15B	5.45	95.9B	255B	24.7	78.5B	115B	6.41
Copper	34	254	270	<u>2500</u>	51.3	8.36	<u>1720</u>	320	45.5		30.7	231	20.8	19.4	1330	1320	61.2	680	<u>704</u>	15.6
Lead	46.7		218	1000	31.8	5.08B	314	76.1	10.2B		8.41	68.9	5.57B	6.64	125	358B	12.3	105	210B	2.62
Mercury	0.15		<u>0.71</u>	<u>20</u>	0.61	0.14	<u>2.23</u>	0.282	0.09		<u>0.84</u>	<u>1.94</u>	0.07	0.05	<u>1.05</u>	<u>2.43</u>	0.221	0.63	<u>3.21</u>	0.0523
Nickel	20.9		<u>51.6</u>	2000	9.75	4.29	46.3	7.13	4.28		5.09	12.4	5.02	4.37	39.5	31.9	14.3	42.2	33.7	4.17
Silver	1		<u>3.7</u>	<u>500</u>	0.17	<0.123	0.94	<0.130	<0.122		<0.127	<0.147	<0.120	<0.119	0.75	0.82	<0.145	0.64	0.56	<0.123
Zinc	150		<u>410</u>	<u>5000</u>	89.6	29.4	<u>1780</u>	292	152		47.4	176	49.6	57.6	<u>650</u>	<u>1340</u>	95.7	<u>495</u>	<u>1710</u>	21.7
Organochlorine Pesticides	(µg/kg)																			
2,4'-DDD	···		_	_	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
2,4'-DDE	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
2,4'-DDT	-		_	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
4,4'-DDD	2		20	1000	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	35	<1.2
4,4'-DDE	2.2		27	1000	9.6	<1.2	51	16	7.1		4.9	30	1.8	1.3	26	97	1.8	37	86	2.4
4,4'-DDT	1		7	1000	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	19	<1.2
Total DDTs	1.58		46.1	1000	9.6	0	51	16	7.1		4.9	30	1.8	1.3	26	97	1.8	37	140	2.4
Aldrin	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Alpha-BHC	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Beta-BHC	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Chlordane	0.5		<u>6</u>	<u>2500</u>	<u><12</u>	<u><12</u>	<20	<u><13</u>	<u><12</u>		<u><13</u>	<u><15</u>	<u><12</u>	<u><12</u>	<22	<u><18</u>	<u><15</u>	<26	<u><18</u>	<12
Delta-BHC	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Dieldrin	0.02		<u>8</u>	<u>8000</u>	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endosulfan I	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endosulfan II	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endosulfan Sulfate	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endrin	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endrin Aldehyde	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Endrin Ketone	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Gamma-BHC	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Heptachlor	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Heptachlor Epoxide	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Methoxychlor	-		-	-	<1.2	<1.2	<2.0	<1.3	<1.2		<1.3	<1.5	<1.2	<1.2	<2.2	<1.8	<1.5	<2.6	<1.8	<1.2
Toxaphene	-		-	-	<24	<25	<40	<26	<24		<25	<29	<24	<24	<43	<37	<29	<51	<37	<25
Organotins (µg/kg)																				
Dibutyltin	-		-	-	18	<3.7	1100	220	77	<3.7	72	230	12	7.2	630	890	19	250	52	11
Monobutyltin	-		-	-	<3.7	<3.7	97	<20	<3.7	<3.7	<3.8	<22	<3.6	<3.6	110	18	<4.4	31	<5.6	<3.7
Tetrabutyltin	-		-	-	<3.7	<3.7	18	<20	<3.7	<3.7	<3.8	<22	<3.6	<3.6	19	28	<4.4	<7.7	12	<3.7
Tributyltin	-		-	-	38	<3.7	3300	480	250	4	120	490	31	19	2300	2600	94	950	610	30

Table 5. Continued

									Within	Parcel 4					Within Parcel 4						
		LBNS			Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase II		
Analyte	ERL	(Copper	ERM	TTLC	SWM32	SWM32	SWM32	SWM32	SWM33	SWM33	SWM33	SWM33	SWM34	SWM34	SWM34	SWM34	SWM35	SWM35	SWM35		
		only)			0-2 ft	4-6 ft	6-8 ft	8-10 ft	0-2 ft	4-6 ft	6-8 ft	12-13 ft	0-2 ft	4-6 ft	6-8 ft	8-10 ft	0-2 ft	4-6 ft	6-8 ft		
Grain Size (%)	•			•		•	•								•		•				
Gravel	_		_	-	2.22	0.33	0.36	0.47	11.53	3.32	3.33	0.00	3.86	0.18	0.02	0.01	0.60	1.91	1.41		
Sand	_		_	-	13.19	75.29	95.98	96.37	16.54	7.62	29.62	96.72	8.27	64.80	80.64	94.32	85.25	94.03	95.90		
Silt	-		_	<u> </u>	43.29	13.29	1.70	1.52	34.90	41.35	33.82	1.84	41.42	15.52	9.05	2.71	7.76	1.63	1.03		
Clay	-		-	_	41.30	11.09		1.64		47.72		1.44						2.43			
General Chemistry	-		-	_	41.30	11.09	1.96	1.04	37.03	47.72	33.22	1.44	46.45	19.51	10.29	2.96	6.39	2.43	1.67		
	1		1					l				0.02				0.11					
TOC (%)	-		-	-	2.94	0.32	0.06	0.05	3.12	3.51	2.86	0.03	3.61	1.30	0.45	0.11	0.25	0.40	0.04		
Metals (mg/kg)	_																				
Arsenic	8.2		<u>70</u>	<u>500</u>	23.3	12	3.05		28.4	<u>76.2</u>	35.2	2.01	17.6	21.7	9.67		6.63	4.35	4.98		
Cadmium	1.2		<u>9.6</u>	<u>100</u>	0.88	0.58	<0.123		1.13	2.99	1.72	2.97	1.12	0.77	0.389		0.25	<0.128	<0.123		
Chromium	81		<u>370</u>	<u>2500</u>	87.9B	80.1B	14.8		83.6B	117B	124	6.73	73.7B	59.4B	27		30.1B	15.0B	11		
Copper	34	254	<u>270</u>	<u>2500</u>	<u>1160</u>	<u>625</u>	54.9		<u>1150</u>	<u>1350</u>	<u>997</u>	11.4	244	<u>641</u>	163		122	49.9	21.1		
Lead	46.7		<u>218</u>	<u>1000</u>	83.4	98.8B	20.9		102	272B	<u>248</u>	2.42	57.6	81.7B	37.8		77.1	15.4	7.31		
Mercury	0.15		<u>0.71</u>	<u>20</u>	0.63	0.53	0.172		<u>1.08</u>	<u>1.33</u>	<u>3.22</u>	<0.0247	0.62	0.6	0.515		<u>0.94</u>	0.52	0.0606		
Nickel	20.9		<u>51.6</u>	<u>2000</u>	43.6	13.8	4.95		43.6	40.8	37.1	5.71	42.7	27.2	13.2		8.06	7.87	7.17		
Silver	1		<u>3.7</u>	<u>500</u>	0.73	0.3	<0.123		0.68	0.88	0.492	<0.123	0.57	0.52	<0.149		<0.130	<0.128	<0.123		
Zinc	150		<u>410</u>	<u>5000</u>	<u>506</u>	<u>676</u>	79.6		<u>567</u>	<u>1600</u>	<u>1100</u>	33.4	281	366	198		154	<u>771</u>	22.5		
Organochlorine Pesticides	(µg/kg)				_																
2,4'-DDD	-		-	-	<2.2	<1.4	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
2,4'-DDE	-		-	-	<2.2	<1.4	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
2,4'-DDT	-		-	-	<2.2	<1.4	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
4,4'-DDD	2		<u>20</u>	<u>1000</u>	<2.2	8.1	<1.2		<2.3	<2.4	<u>23</u>	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
4,4'-DDE	2.2		<u>27</u>	<u>1000</u>	<u>33</u>	<u>36</u>	13		<u>32</u>	<u>36</u>	<u>78</u>	1.3	17	22	<u>31</u>	10	<u>54</u>	6.1	1.4		
4,4'-DDT	1		<u>7</u>	<u>1000</u>	<2.2	<u>14</u>	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Total DDTs	1.58		<u>46.1</u>	<u>1000</u>	33	<u>58.1</u>	13		32	36	<u>101</u>	1.3	17	22	31	10	<u>54</u>	6.1	1.4		
Aldrin	-		-	-	<2.2	<1.4	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Alpha-BHC	-		-	-	<2.2	<1.4	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Beta-BHC	-		-	-	<2.2	<1.4	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Chlordane	0.5		<u>6</u>	<u>2500</u>	<u><22</u>	<u><14</u>	<u><12</u>		<u><23</u>	<u><24</u>	<u><20</u>	<u><12</u>	<u><23</u>	<18	<15	<13	<13	<13	<12		
Delta-BHC	-		-	-	<2.2	<1.4	<1.2	•	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Dieldrin	0.02		<u>8</u>	<u>8000</u>	<2.2	<1.4	<1.2	•	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Endosulfan I	-			-	<2.2	<1.4	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Endosulfan II Endosulfan Sulfate	-		-	-	<2.2 <2.2	<1.4 <1.4	<1.2 <1.2	•	<2.3 <2.3	<2.4 <2.4	<2.0 <2.0	<1.2 <1.2	<2.3 <2.3	<1.8 <1.8	<1.5 <1.5	<1.3 <1.3	<1.3 <1.3	<1.3 <1.3	<1.2 <1.2		
Endosuliari Suliate	+ -			-	<2.2	<1.4	<1.2	•	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Endrin Aldehyde	+ -		-	-	<2.2	<1.4	<1.2	•	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Endrin Ketone	+ -			-	<2.2	<1.4	<1.2	•	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Gamma-BHC	-		-	-	<2.2	<1.4	<1.2	•	<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Heptachlor	-		-	_	<2.2	<1.4	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Heptachlor Epoxide	-		-	-	<2.2	<1.4	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Methoxychlor	-		-	-	<2.2	<1.4	<1.2		<2.3	<2.4	<2.0	<1.2	<2.3	<1.8	<1.5	<1.3	<1.3	<1.3	<1.2		
Toxaphene	-		-	-	<44	<27	<25		<47	<49	<41	<25	<45	<35	<30	<26	<26	<26	<25		
Organotins (µg/kg)	•																				
			_	_	710	170	82	40	260	92	670	48	64	45	140	44	63	-20	-27		
Dibutyltin Monobutyltin	-		-	-	710	<4.1	<18	<3.7	<7.0	82 <7.3	670 <62	<3.7	<6.8	<5.3	48	<3.9	<3.9	<3.8 <3.8	<3.7 <3.7		
Tetrabutyltin	+ -		-	-	32	<4.1	<18	<3.7	<7.0	<7.3	<62	<3.7	<6.8	<5.3	<4.5	<3.9	<3.9	<3.8	<3.7		
Tributyltin	1		-		4200	490	600	97	650	670	2600	94	140	580	230	160	66	<3.8	<3.7		

Table 5. Continued

								Within F	Parcel 4					V	/ithin Parcel	4		
		LBNS			Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase II	Phase I	Phase II	Phase I	Phase I	Phase I	Phase II	Phase III
Analyte	ERL	(Copper	ERM	TTLC	SWM36	SWM36	SWM36	SWM36	SWM37	SWM37	SWM37	SWM38	SWM38	SWM38	SWM39	SWM39	SWM39	SWM39
		only)			0-2 ft	4-6 ft	6-8 ft	10-10.5 ft	0-2 ft	4-6 ft	6-7 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	6-8 ft	8-10 ft
Grain Size (%)				1		•	ı									•	•	
Gravel	T .				8.07	0.37	2.69	5.36	0.05	2.81	25.02	14.02	4.45	5.33	9.76	2.63	0.11	0.45
Sand	<u> </u>		_	-	56.47	92.10	69.60	90.03	91.92	90.65	70.64	72.78	92.61	89.73	5.46	16.20	76.11	94.23
Silt	 			_		t												
	 			-	18.28	4.20	15.72	2.00	3.46	2.67	1.71	5.36	1.66	2.14	52.87	49.27	13.75	3.06
Clay	-		-	-	17.18	3.33	11.99	2.62	4.56	3.87	2.63	7.83	1.27	2.80	31.91	31.90	10.02	2.26
General Chemistry	1			1	1	1	ı	1			ı	1	1	1	1	1	1	<u> </u>
TOC (%)	-		-	-	2.28	0.49	1.75	0.07	0.18	0.16	0.12	0.80	0.05	0.07	3.13	3.37	0.38	0.08
Metals (mg/kg)																		
Arsenic	8.2		<u>70</u>	<u>500</u>	33.9	13.7	23.1	2.3	4.5	3.45	2.84	10.2	3.35	3.65	24.1	31.7	11.3	2.7
Cadmium	1.2		<u>9.6</u>	<u>100</u>	1.36	0.58	0.752	<0.120	0.13	0.15	<0.132	0.38	<0.120	<0.130	1.5	2.38	0.502	<0.125
Chromium	81		<u>370</u>	<u>2500</u>	311B	176B	132	13.5	17.5B	11.6B	10.9	37.5B	17.4	8.09B	114B	221B	60.7	8.69
Copper	34	254	<u>270</u>	<u>2500</u>	<u>2190</u>	<u>2100</u>	<u>2020</u>	96.6	128	76.9	65.5	<u>403</u>	14.1	6.51	<u>593</u>	<u>1180</u>	<u>394</u>	19
Lead	46.7		<u>218</u>	<u>1000</u>	<u>522</u>	<u>395B</u>	<u>720</u>	16.6	59.5	28.7B	73.9	<u>470</u>	3.63	5.09	158	<u>586B</u>	117	6.56
Mercury	0.15		<u>0.71</u>	<u>20</u>	<u>6.99</u>	<u>12.7</u>	0.349	0.366	0.59	<u>0.98</u>	0.618	<u>0.94</u>	0.0637	0.03	<u>1.18</u>	<u>9.34</u>	<u>1.47</u>	0.0412
Nickel	20.9		<u>51.6</u>	<u>2000</u>	31.8	9.24	13.6	5.25	6.45	5.32	14	16.1	5.16	6.32	44.1	42.2	13.7	5.15
Silver	1		<u>3.7</u>	<u>500</u>	0.59	<0.119	<0.118	<0.120	<0.130	<0.119	<0.132	<0.135	<0.120	<0.130	0.93	0.94	<0.137	<0.125
Zinc	150		<u>410</u>	<u>5000</u>	<u>1260</u>	<u>1100</u>	<u>655</u>	49.3	83.2	67.8	137	250	83.8	150	<u>619</u>	<u>724</u>	211	27.4
Organochlorine Pesticides (μg/kg)																	
2,4'-DDD	-		-	-	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
2,4'-DDE	-		-	-	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
2,4'-DDT	-		-	-	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
4,4'-DDD	2		<u>20</u>	<u>1000</u>	<u>57</u>	<u>62</u>	<1.2		<1.3	5.3	4.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
4,4'-DDE	2.2		<u>27</u>	<u>1000</u>	<u>89</u>	<u>80</u>	<1.2		7.3	11	13	<u>100</u>	10	<1.3	27	<u>230</u>	<u>64</u>	12
4,4'-DDT	1		<u>7</u>	<u>1000</u>	<1.6	<1.2	<1.2		<1.3	6.1	<1.3	<1.4	<1.2	<1.3	<u>7.3</u>	<1.9	<1.4	<1.2
Total DDTs	1.58		<u>46.1</u>	<u>1000</u>	<u>146</u>	<u>142</u>	0		7.3	22.4	17.3	<u>100</u>	10	0	34.3	<u>230</u>	<u>64</u>	12
Aldrin	-		-	-	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Alpha-BHC	-		-	-	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Beta-BHC	-		-	-	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	7.3	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Chlordane	0.5		<u>6</u>	<u>2500</u>	<u><16</u>	<u><12</u>	<u><12</u>		<u><13</u>	<u><12</u>	<u><13</u>	<u><14</u>	<u><12</u>	<u><13</u>	<u><21</u>	<u><19</u>	<u><14</u>	<u><12</u>
Delta-BHC	-		-	-	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Dieldrin	0.02		8	<u>8000</u>	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endosulfan I	-		-	-	<1.6	<1.2	<1.2	•	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endosulfan II	-		<u> </u>	-	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endosulfan Sulfate	-		-	-	<1.6	<1.2	<1.2	•	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endrin	-		-	-	<1.6	<1.2	<1.2	•	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endrin Aldehyde	-		-	-	<1.6	<1.2	<1.2	•	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Endrin Ketone Gamma-BHC	-		-	-	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
	 -		<u> </u>	-	<1.6	<1.2	<1.2	•	<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Heptachlor Heptachlor Epoxide	+ -				<1.6 <1.6	<1.2 <1.2	<1.2 <1.2	•	<1.3 <1.3	<1.2 <1.2	<1.3 <1.3	<1.4 <1.4	<1.2 <1.2	<1.3 <1.3	<2.1 <2.1	<1.9 <1.9	<1.4 <1.4	<1.2 <1.2
Methoxychlor	+ -		- -	-	<1.6	<1.2	<1.2		<1.3	<1.2	<1.3	<1.4	<1.2	<1.3	<2.1	<1.9	<1.4	<1.2
Toxaphene	+ -			-	<33	<24	<23		<26	<24	<26	<27	<24	<26	<43	<38	<28	<25
Organotins (µg/kg)		<u>I</u>			\ JJ	1 \4	\ 20		\ _U	\ _+	\20	\ <u></u>	\ 24	\ 20	\ + 3	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	<u> </u>	_ \20
	1	1			_					_	1 .	II -		<u> </u>	I	1 .	ı .	
Dibutyltin	-		-	-	220	280	<3.5		51	31	17	260	<3.6	<3.9	270	39	25	
Monobutyltin	-		-	-	<4.9	<3.6	<3.5		<3.9	<3.6	<4.0	23	<3.6	<3.9	25	<5.8	<4.1	
Tetrabutyltin	-		-	-	13	24	<3.5		<3.9	<3.6	<4.0	25	<3.6	<3.9	<6.4	10	<4.1	

Table 6. Summary of Physical Measurements and Chemistry Analytical Results for the Area Offshore of Parcel 4, Southwest Marine Leasehold, Port of Los Angeles with a Comparison to Sediment Quality Values

							Offshore of	of Parcel 4				Offs	shore of Pard	cel 4	
		LBNS			Phase I	Phase I	Phase I	Phase II	Phase I	Phase II	Phase III				
Analyte	ERL	(Copper	ERM	TTLC	SWM41	SWM41	SWM42	SWM42	SWM42	SWM43	SWM43	SWM44	SWM44	SWM44	SWM44
-		only)			0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	0-2 ft	4-6 ft	6-8 ft	8-10 ft
rain Size (%)	<u> </u>														
Gravel	1 -		_	-	0.38	0.02	0.89	0.45	2.92	0.63	5.38	2.32	1.45	1.98	5.28
Sand	 		_	-	96.97	97.46	53.36	75.32	94.04	92.65	84.91	67.77	79.45	77.65	92.02
Silt	-		-	_	1				1				1	1	
	+ -		-	-	1.52	1.19	23.20	14.54	1.19	4.66	6.39	14.15	10.94	11.15	1.16
Clay			-	-	1.13	1.32	22.55	9.69	1.85	2.06	3.32	15.76	8.16	9.22	1.54
Seneral Chemistry	1	<u> </u>	I		ı		1		1	1		1	ı	1	
TOC (%)	-		-	-	0.03	0.03	1.10	0.67	0.03	0.05	0.07	0.85	0.70	0.96	0.03
letals (mg/kg)					_										
Arsenic	8.2		<u>70</u>	<u>500</u>	2.75	2.45	11	8.17	2.11	2.38	2.95	11.6	13.5	11.2	2.86
Cadmium	1.2		<u>9.6</u>	<u>100</u>	<0.120	<0.122	0.65	0.465	<0.122	<0.125	<0.123	0.7	2.76	0.698	<0.120
Chromium	81		<u>370</u>	<u>2500</u>	5.31B	5.12B	54.2B	38.2	5.86B	8.43B	11.0B	136	151	112	4.63
Copper	34	254	<u>270</u>	<u>2500</u>	6.79	4.43	261	158	6.7	19.9	15.1	<u>343</u>	<u>422</u>	<u>377</u>	4.14
Lead	46.7		<u>218</u>	<u>1000</u>	2.31	1.68	<u>327</u>	73.4	2.55	4.94	5.52	<u>293</u>	<u>854</u>	<u>276</u>	3.31
Mercury	0.15		<u>0.71</u>	<u>20</u>	<0.0241	<0.0245	<u>0.98</u>	<u>1.69</u>	0.07	0.05	0.41	<u>1.29</u>	<u>16</u>	0.131	<0.0241
Nickel	20.9		<u>51.6</u>	<u>2000</u>	4.13	4.11	22.4	13.6	9.75	5.95	8.11	16.3	12.4	13.8	3.94
Silver	1		3.7	<u>500</u>	<0.120	<0.122	0.24	<0.135	<0.122	<0.125	<0.123	0.3	0.31	<0.130	<0.120
Zinc	150		<u>410</u>	<u>5000</u>	23.4	69.1	227	156	79.4	40.3	36.6	391	<u>6890</u>	<u>659</u>	14.6
rganochlorine Pesticides (µg/kg	g)														
2,4'-DDD	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
2,4'-DDE	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
2,4'-DDT	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
4,4'-DDD	2		20	1000	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
4,4'-DDE	2.2		27	1000	<1.2	<1.2	<u>96</u>	27	<1.2	3.3	<1.2	<1.4	<1.3	<1.3	
4,4'-DDT	1		7	1000	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Total DDTs	1.58		<u>46.1</u>	1000	0	0	<u>96</u>	27	0	3.3	0	0	0	0	
Aldrin	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Alpha-BHC	-		-		<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Beta-BHC	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Chlordane	0.5		<u>6</u>	<u>2500</u>	<u><12</u>	<u><12</u>	<u><16</u>	<u><14</u>	<u><12</u>	<u><12</u>	<u><12</u>	<u><14</u>	<u><13</u>	<u><13</u>	
Delta-BHC	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Dieldrin	0.02		<u>8</u>	<u>8000</u>	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Endosulfan I	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Endosulfan II	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Endosulfan Sulfate	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Endrin	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Endrin Aldehyde	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Endrin Ketone	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Gamma-BHC	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Heptachlor	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Heptachlor Epoxide	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Methoxychlor	-		-	-	<1.2	<1.2	<1.6	<1.4	<1.2	<1.2	<1.2	<1.4	<1.3	<1.3	
Toxaphene	-		-	-	<24	<24	<32	<27	<24	<25	<25	<28	<26	<26	
rganotins (µg/kg)															
Dibutyltin	-		-	-	<3.6	<3.7	110	31	<3.7	<3.8	<3.7	97	110	64	
Monobutyltin	-		-	-	<3.6	<3.7	<4.8	<4.1	<3.7	<3.8	<3.7	29	24	11	
Tetrabutyltin	-		-	-	<3.6	<3.7	<4.8	<4.1	<3.7	<3.8	<3.7	5.9	4.5	<3.9	
Tributyltin	-	İ	-	-	<3.6	<3.7	620	46	<3.7	12	<3.7	420	240	92	

Table 7. Summary of Physical Measurements and Chemistry Analytical Results for the Area Offshore of Parcel 5, Southwest Marine Leasehold, Port of Los Angeles with a Comparison to Sediment Quality Values

							Parcel 5					Parcel 5					Parcel 5		
		LBNS			Phase I	Phase II	Phase I	Phase I	Phase II	Phase I	Phase I	Phase I	Phase I	Phase II	Phase I	Phase I	Phase I	Phase II	Phase III
Analyte	ERL	(Copper	ERM	TTLC	SWM45	SWM45	SWM45	SWM46	SWM46	SWM46	SWM47	SWM47	SWM48	SWM48	SWM48	SWM49	SWM49	SWM49	SWM49
•		only)			0-2 ft	2-4 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	6-8 ft	12-14 ft
Grain Size (%)	ı									-						Ш			
Gravel	I -		_	-	2.15	1.76	0.25	1.37	0.18	0.50	0.03	1.32	3.38	10.70	0.36	0.38	1.36	1.21	2.81
Sand				<u> </u>	94.37	40.17	93.16	63.45	96.25	92.19	96.69	95.20	72.71	68.22	94.23	92.16	87.57	90.39	95.42
Silt	-		-	_	ì													5.04	
Clay	+ -		-	-	1.34	30.17	3.16	21.48	1.85	3.79	1.51	1.42	13.61	11.56	3.82	4.32	6.21		0.76
General Chemistry	-		-		2.13	27.90	3.43	13.70	1.71	3.52	1.77	2.06	10.30	9.52	1.60	3.14	4.85	3.36	1.01
				1	4.55	0.00	0.40	0.45	0.04	0.04	4.00	0.00	0.40	0.07	0.00	0.40	0.05	0.00	T 0.02
TOC (%)	-		-	-	1.55	2.39	0.18	3.15	0.04	0.04	1.39	0.06	0.42	0.87	0.08	0.12	0.35	0.28	0.03
Metals (mg/kg)	1 00		70	F00	40.0	140		100	0.40	0.00	0.40	0.00	4.50	7.05	0.0	104	4= 4	7.04	T 4.5
Arsenic	8.2		<u>70</u>	<u>500</u>	12.8	11.6	3.84	10.6	3.16	3.39	8.42	3.22	4.53	7.85	2.2	4.24	17.4	7.61	1.5
Cadmium	1.2 81		9.6 370	<u>100</u>	0.76	0.992	<0.133	0.87	<0.127	<0.127	0.33	<0.128	0.13	0.937	<0.123	0.22	1.43 129	0.492	<0.122
Coppor	34	254	270	<u>2500</u> <u>2500</u>	78.6 206	49 72.7	9.42 14.5	46.7 52.8	6.77 4.24	6.68 5.14	72.4 139	9.41 16.3	70.7 39.6	53.5 108	5.14 9.63	34.4 52.8	359	45.5 191	3.45 15.2
Copper Lead	46.7	234	218	1000	148	43	4.82	41.8	1.82	2.28	128	14.4	71.5	175	33.8	86.4	962	408	10.2
Mercury	0.15		0.71	20	0.92	0.86	0.38	0.74	0.03	0.03	0.4	0.26	3.12	1.87	0.41	0.43	0.48	1.22	<0.0245
Nickel	20.9		51.6	2000	22.4	41	7.01	39.5	4.89	5.04	26.2	5.22	7.22	16.9	3.48	15	24.4	9.73	3.36
Silver	1		3.7	<u>500</u>	0.33	0.183	<0.133	0.24	<0.127	<0.127	0.17	<0.128	<0.130	<0.130	<0.123	<0.127	0.35	<0.123	<0.122
Zinc	150		410	5000	409	130	34.7	122	19.6	75.1	179	44.3	123	298	33.1	173	1480	1910	44.5
Drganochlorine Pesticides (μg/k								II.											
2,4'-DDD			_	_	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
2,4'-DDE	-		-	_	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	† • • • • • • • • • • • • • • • • • • •
2,4'-DDT	_		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
4,4'-DDD	2		20	1000	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
4,4'-DDE	2.2		27	1000	8.3	<1.7	<1.3	<1.7	<1.3	<1.3	7.1	2.1	6.8	21	1.3	6.8	21	26	
4,4'-DDT	1		7	1000	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Total DDTs	1.58		<u>46.1</u>	1000	8.3	0	0	0	0	0	7.1	2.1	6.8	21	1.3	6.8	21	26	
Aldrin	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Alpha-BHC	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Beta-BHC	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Chlordane	0.5		<u>6</u>	<u>2500</u>	<u><15</u>	<u><17</u>	<u><13</u>	<u><17</u>	<u><13</u>	<u><13</u>	<u><15</u>	<u><13</u>	<u><13</u>	<u><13</u>	<u><12</u>	<u><13</u>	<u><13</u>	<u><12</u>	
Delta-BHC	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Dieldrin	0.02		<u>8</u>	<u>8000</u>	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Endosulfan I	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Endosulfan II	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Endosulfan Sulfate	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Endrin	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Endrin Aldehyde	-		-	-	<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	•
Endrin Ketone Gamma-BHC	-		-	-	<1.5	<1.7	<1.3 <1.3	<1.7 <1.7	<1.3	<1.3 <1.3	<1.5	<1.3	<1.3 <1.3	<1.3	<1.2	<1.3 <1.3	<1.3	<1.2	•
Heptachlor	-		-		<1.5 <1.5	<1.7 <1.7	<1.3	<1.7	<1.3 <1.3	<1.3	<1.5 <1.5	<1.3 <1.3	<1.3	<1.3 <1.3	<1.2 <1.2	<1.3	<1.3 <1.3	<1.2 <1.2	
Heptachlor Epoxide	+ :		-		<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Methoxychlor	-				<1.5	<1.7	<1.3	<1.7	<1.3	<1.3	<1.5	<1.3	<1.3	<1.3	<1.2	<1.3	<1.3	<1.2	
Toxaphene	-		_	-	<31	<34	<27	<34	<25	<25	<29	<26	<26	<26	<25	<25	<26	<25	
Organotins (µg/kg)	1	1			.01				0			.20	<u> </u>		,	<u> </u>		,20	
Dibutyltin	T -		_	-	<4.6	<5.2	<4.0	<5.2	<3.9	<3.8	14	11	8	21	<3.7	11	<3.9	<3.7	
Monobutyltin	-		-	-	<4.6	<5.2	<4.0	<5.2	<3.9	<3.8	<4.4	<3.8	<3.9	<3.9	<3.7	<3.8	<3.9	<3.7	
	 	†	_		<4.6	<5.2	<4.0	<5.2	<3.9	<3.8	<4.4	<3.8	<3.9	<3.9	<3.7	<3.8	<3.9	<3.7	
Tetrabutyltin																			

Table 7. Continued

							Parcel 5					Par	cel 5					Parcel 5		
		LBNS			Phase I	Phase I	Phase II	Phase II	Phase III	Phase I	Phase I	Phase II	Phase I	Phase II	Phase I	Phase I	Phase I	Phase I	Phase I	Phase III
Analyte	ERL	(Copper	ERM	TTLC	SWM50	SWM50	SWM50	SWM50	SWM50	SWM51	SWM51	SWM51	SWM52	SWM52	SWM52	SWM53	SWM53	SWM53	SWM53	SWM53
1		only)			0-2 ft	4-6 ft	6-8 ft	6-8 ft DUP	12-14 ft	0-2 ft	4-6 ft	6-8 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	4-6 ft DUP	6-8 ft	8-10 ft
Grain Size (%)					0210	4010	0011	0 0 11 001	12 1710	0211	7010	0010	0210	2710	1 4010	0210	4010	401000	0011	1 0 10 11
` '		I	1	1												II				T
Gravel	+ -		-	-	0.43	3.85	4.30		3.06	1.11	5.20	2.15	4.51	0.69	1.46	0.27	4.13		5.10	2.64
Sand	-		-	-	97.07	78.85	79.89		93.62	95.07	66.23	90.79	70.73	87.08	95.07	97.20	80.44		82.00	88.67
Silt	-		-	-	1.25	9.60	8.59		1.15	1.71	17.38	4.04	14.04	6.65	1.93	1.34	9.48		7.51	4.95
Clay	-		-	-	1.25	7.70	7.22		2.17	2.10	11.19	3.02	10.73	5.58	1.54	1.20	5.95		5.39	3.73
General Chemistry																				
TOC (%)	-		-	-	0.24	0.81	0.03		0.08	0.15	1.17	0.22	0.79	0.57	0.08	0.05	0.45		0.35	0.18
Metals (mg/kg)																				
Arsenic	8.2		70	500	4.05	9.36	8.57	8.82	2.39	3.97	13.7	3.75	16.5	13.8	3.04	2.99	7.15	3.16	3.55	10.4
Cadmium	1.2		9.6	100	0.31	0.57	1.18	1.18	<0.120	<0.172	0.96	0.142	0.96	3.45	0.13	<0.128	0.5	<0.127	0.165	0.976
Chromium	81		370	2500	44.3	365	90.3	95	6.11	49.0B	830B	27.6	319B	178	9.48B	30.3B	92.7B	22.5	29.2	70.1
Copper	34	254	270	2500	126	322	722	849	30	28.8	175	73.4	427	197	16.9	42.4	148	62.1	39.1	171
Lead	46.7		218	1000	269	693	837	763	27.8	28.6	387	77.5	517	3080	52.5	23.5	535	62.6	31.9	229
Mercury	0.15		0.71	20	1.63	4.06	0.527	0.297	0.205	0.75	2.29	0.705	6.44	0.402	0.52	0.32	0.51	0.38	1.47	0.564
Nickel	20.9		51.6	2000	10.8	16.9	15.7	15.4	7.11	8.85	28.5	6.32	28.1	14.2	9.82	8.7	24.7	8.21	8.67	18.3
Silver	1		3.7	500	<0.135	0.25	0.289	0.303	<0.120	0.81	0.4	<0.123	0.25	0.383	<0.123	<0.128	0.17	<0.127	<0.125	0.277
Zinc	150		410	5000	398	486	640	696	72.7	133	664	172	813	6060	101	59.8	292	64	82.3	863
Organochlorine Pesticides (µg/kg	a)	•								•								•		
2,4'-DDD	<u>"</u>		_		<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
2,4'-DDE	<u> </u>		_	_	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
2,4'-DDT	+ -		-		<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
4,4'-DDD	2		20	1000	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
4,4'-DDE	2.2		27	1000	21	78	34	210	3.2	12	73	12	250	33	2.2	3.6	24	2.7	40	38
4,4'-DDT	1		7	1000	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Total DDTs	1.58		46.1	1000	21	78	34	210	3.2	12	73	12	250	33	2.2	3.6	24	2.7	40	38
Aldrin	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Alpha-BHC	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Beta-BHC	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Chlordane	0.5		<u>6</u>	<u>2500</u>	<u><14</u>	<u><12</u>	<u><12</u>	<u><13</u>	<u><12</u>	<u><17</u>	<u><15</u>	<12	<u><14</u>	<u><13</u>	<u><12</u>	<u><13</u>	<u><13</u>	<13	<12	<u><12</u>
Delta-BHC	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Dieldrin	0.02		<u>8</u>	<u>8000</u>	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endosulfan I	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endosulfan II	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endosulfan Sulfate	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endrin	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endrin Aldehyde	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Endrin Ketone	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Gamma-BHC	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Heptachlor	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Heptachlor Epoxide	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Methoxychlor	-		-	-	<1.4	<1.2	<1.2	<1.3	<1.2	<1.7	<1.5	<1.2	<1.4	<1.3	<1.2	<1.3	<1.3	<1.3	<1.2	<1.2
Toxaphene	-		-	-	<27	<25	<25	<26	<24	<34	<30	<25	<27	<26	<25	<26	<26	<25	<25	<25
Organotins (µg/kg)																				
Dibutyltin	-		-	-	<4.1	28	<3.7	<3.9		<5.2	11	<3.7	230	<3.8	<3.7	<3.8	31	<3.8	<3.8	
Monobutyltin	-		-	-	<4.1	<3.7	<3.7	<3.9		<5.2	<4.5	<3.7	<4.1	<3.8	<3.7	<3.8	<3.9	<3.8	<3.8	
Tetrabutyltin	-		-	-	<4.1	<3.7	<3.7	<3.9		<5.2	<4.5	<3.7	17	<3.8	<3.7	<3.8	<3.9	<3.8	<3.8	
Tributyltin	-		-	-	89	210	<3.7	<3.9		19	20	<3.7	1600	4.6	<3.7	33	180	26	8.4	

Table 7. Continued

							Parcel 5					Par	cel 5					Parcel 5		
		LBNS			Phase I	Phase II	Phase I	Phase I	Phase I	Phase I	Phase II	Phase I	Phase I	Phase II	Phase I	Phase III	Phase I	Phase I	Phase I	Phase
Analyte	ERL	(Copper	ERM	TTLC	SWM54	SWM54	SWM54	SWM55	SWM55	SWM56	SWM56	SWM56	SWM57	SWM57	SWM57	SWM57	SWM58	SWM58	SWM59	SWM59
-		only)			0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	6-8 ft	0-2 ft	4-6 ft	0-2 ft	4-6 ft
rain Size (%)	<u> </u>							11					11						1	
Gravel		T		_	4.00	1 4 4 4	0.00	0.05	F 00	2.50	0.07	4.00	0.07	2.07	4.07	0.74	0.05	4.45	4.40	4.04
	 	1	-	ł	1.89	1.14	0.99	0.95	5.08	2.58	3.67	4.68	0.27	3.07	1.97	3.71	0.95	1.45	1.43	4.21
Sand	-		-	-	67.41	95.76	97.19	95.16	90.96	67.00	78.04	93.43	54.11	87.44	94.61	93.80	19.17	94.03	87.56	93.92
Silt	-		-	-	18.01	1.42	0.92	1.56	2.04	14.03	9.48	0.76	24.18	5.27	1.45	0.92	48.71	2.46	6.10	0.50
Clay	-		-	-	12.69	1.68	0.91	2.33	1.91	16.39	8.81	1.13	21.43	4.21	1.97	1.57	31.17	2.06	4.90	1.37
eneral Chemistry		_																		
TOC (%)	-		-	-	1.41	0.04	0.02	0.08	0.12	1.59	1.84	0.04	0.96	0.30	0.08	0.18	0.18	0.06	0.16	0.03
letals (mg/kg)																				
Arsenic	8.2		70	500	12.6	1.6	1.39	3.4	5.63	10.2	9.13	2	7.38	3.18	2.29		3.41	1.73	3.89	1.35
Cadmium	1.2		9.6	100	1.08	<0.123	<0.127	0.13	0.19	0.59	0.628	<0.125	0.38	0.129	<0.123		<0.128	<0.128	<0.123	<0.12
Chromium	81		370	2500	103B	5.38	4.16B	44.8B	48.8B	89.4B	69.3	7.73B	113	49.7	20.1		34.6	9.38	12.1	3.69
Copper	34	254	270	2500	221	4.29	3	64.9	132	215	147	10.2	154	35.5	33.9		42.6	12	84.4	10.9
Lead	46.7		218	1000	<u>255</u>	4.42	1.26	38.5	207	143	191	4.91	293	24	11.8		32.9	8.45	10.4	1.72
Mercury	0.15		0.71	20	1.78	0.126	<0.0253	0.17	0.32	23.6	0.169	0.08	15.2	0.637	0.1		0.37	0.1	0.1	0.03
Nickel	20.9		51.6	2000	43.7	4.03	3.37	11.4	13.4	25	40.9	4.55	25	8.17	4.47		10.3	4.13	7.79	4.08
Silver	1		3.7	500	0.36	<0.123	<0.127	<0.125	1.27	0.32	0.165	<0.125	0.18	<0.125	<0.123		<0.128	<0.128	<0.123	<0.12
Zinc	150		410	5000	459	23.8	17.8	130	171	328	311	30.5	247	67.3	35.8		77	28.6	56.5	26.9
rganochlorine Pesticides (µg/kg	1)												II.				U:			
	<u>''</u>	T			-1.6	.4.0	1 .4 2	-1.0	-1.1	-1.6	.1.1	-1.0	-4 4	.4.0	-1.0		-1.2	.4.2	.4.0	-1.2
2,4'-DDD 2,4'-DDE	+ -	+	-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2 <1.2	<1.3
	+ -	+	-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	1	<1.3
2,4'-DDT	2	+	-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2	<1.3
4,4'-DDD 4,4'-DDE	2.2	1	20 27	1000 1000	<1.6 300	<1.2 5	<1.3 <1.3	<1.2 5.4	<1.4 5.9	<1.6 73	<1.4 27	<1.2 1.5	<1.4 24	<1.2 9.4	<1.2 2.7		<1.3 10	<1.3 2.7	<1.2 8	<1.3 1.3
4,4'-DDT	1		7	1000	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	•	<1.3	<1.3	<1.2	1.4
Total DDTs	1.58	1	46.1	1000	300	5	0	5.4	5.9	73	27	1.5	24	9.4	2.7		10	2.7	8	2.7
Aldrin	1.30		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	•	<1.3	<1.3	<1.2	<1.3
Alpha-BHC	+ -		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	•	<1.3	<1.3	<1.2	<1.3
Beta-BHC	+ -				<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	•	<1.3	<1.3	<1.2	<1.3
Chlordane	0.5	-	6	2500	<1.6 <16	<1.2 <12	<1.3 <13	<1.2 <12	<14	<1.0 <16	<14	<1.2 <12	<14 <14	<1.2 <12	<1.2 <12		<13 <13	<13	<1.2 <12	<1.3 <13
Delta-BHC	- 0.5		-	<u>2500</u>	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	·	<1.3	<1.3	<1.2	<1.3
Dieldrin	0.02		8	8000	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2	<1.3
Endosulfan I	-	+	-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2	<1.3
Endosulfan II	 	1	-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	•	<1.3	<1.3	<1.2	<1.3
Endosulfan Sulfate	 	1	-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2	•	<1.3	<1.3	<1.2	<1.3
Endrin	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2	<1.3
Endrin Aldehyde	-		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2	<1.3
Endrin Ketone	<u> </u>		_	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2	<1.3
Gamma-BHC	-		_	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2	<1.3
Heptachlor	<u> </u>		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2	<1.3
Heptachlor Epoxide	<u> </u>		-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2	<1.3
Methoxychlor	-	1	-	-	<1.6	<1.2	<1.3	<1.2	<1.4	<1.6	<1.4	<1.2	<1.4	<1.2	<1.2		<1.3	<1.3	<1.2	<1.3
Toxaphene	-	1	-	-	<31	<25	<25	<25	<29	<32	<28	<25	<29	<25	<25		<26	<26	<25	<25
Prganotins (µg/kg)	•					-		-	-	-	-	-	-	-	-		-	-	-	
Dibutyltin	-		-	-	39	<3.7	<3.8	8.7	9.3	54	15	<3.8	120	29	19	10	21	5.9	20	<3.8
Monobutyltin	-		-	-	<4.7	<3.7	<3.8	<3.8	<4.4	<4.8	<2.4	<3.8	24	<3.7	<3.8	<3.7	<3.8	<3.8	10	<3.8
Tetrabutyltin	-	1	-	-	<4.7	<3.7	<3.8	<3.8	<4.4	<4.8	<2.4	<3.8	<4.3	<3.7	<3.8	<3.7	<3.8	<3.8	<3.8	<3.8
Tributyltin	 	†	-		52	<3.7	<3.8	27	35	93	31	7.4	530	81	140	83	210	15	160	16

Table 8. Summary of Physical Measurements and Chemistry Analytical Results for the Area Offshore of Parcel 6, Southwest Marine Leasehold, Port of Los Angeles with a Comparison to Sediment Quality Values

						Par	cel 6				Parcel 6				Par	cel 6	
		LBNS			Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase I	Phase II	Phase I	Phase I	Phase I	Phase II	Phase III
Analyte	ERL	(Copper	ERM	TTLC	SWM40	SWM40	SWM40	SWM40	SWM60	SWM60	SWM61	SWM61	SWM61	SWM62	SWM62	SWM62	SWM62
		only)			0-2 ft	4-6 ft	6-8 ft	8-10 ft	0-2 ft	4-6 ft	0-2 ft	2-4 ft	4-6 ft	0-2 ft	4-6 ft	6-8 ft	8-10 ft
Grain Size (%)	I										II.						
Gravel			-	-	1.52	1.63	2.33	2.20	1.20	2.13	8.95	2.87	1.39	2.59	3.98	14.82	3.92
Sand				_	1					1				65.32			
Silt	-		-	-	94.81	72.15	52.66	57.76	85.20	95.31	81.24	85.98	96.54		78.38	77.44	94.34
	-		-	-	1.97	14.51	21.95	20.02	6.15	0.90	3.93	5.45	0.85	16.50	9.95	4.39	0.63
Clay	-		-	-	1.70	11.72	23.07	20.02	7.45	1.67	5.88	5.71	1.21	15.60	7.69	3.35	1.12
General Chemistry		1		ı	1	ı	1	· ·	I	1	1		I	1	1	ı	ı
TOC (%)	-		-	-	2.80	1.37	2.24	1.97	0.60	0.04	0.29	0.09	0.04	1.21	0.83	0.08	0.03
/letals (mg/kg)																	
Arsenic	8.2		<u>70</u>	<u>500</u>	21.9	18.9	19.6	15.5	5.58	2.33	5.8	2.03	1.61	10.4	7.42	9.52	1.67
Cadmium	1.2		<u>9.6</u>	<u>100</u>	1.37	0.91	1.07	0.891	0.3	<0.125	0.5	<0.119	<0.123	0.57	0.67	0.506	<0.120
Chromium	81		<u>370</u>	<u>2500</u>	159	96.9	51.5	47.7	32.2	16.1	68.1	9.66	5.39	76.3	133	22	4.93
Copper	34	254	<u>270</u>	<u>2500</u>	<u>520</u>	<u>1470</u>	<u>457</u>	<u>478</u>	72.5	48.8	100	23	8.72	195	121	131	5.67
Lead	46.7		<u>218</u>	<u>1000</u>	<u>235</u>	<u>367</u>	<u>219</u>	200	60.2	18.6	<u>251</u>	11.3	2.5	<u>261</u>	<u>224</u>	<u>244</u>	52.1
Mercury	0.15		<u>0.71</u>	<u>20</u>	<u>7.01</u>	<u>22.5</u>	0.375	<u>12.8</u>	0.33	0.07	0.31	0.115	0.08	<u>2.48</u>	<u>2.21</u>	0.214	0.117
Nickel	20.9		<u>51.6</u>	<u>2000</u>	49.4	17.5	38.7	28.2	12.8	4.76	14.1	4.59	4.51	23.3	<u>76.7</u>	19.2	7.83
Silver	1		<u>3.7</u>	<u>500</u>	0.83	0.54	0.383	0.437	<0.133	<0.125	<0.130	<0.119	<0.123	0.3	0.18	<0.123	<0.120
Zinc	150		<u>410</u>	<u>5000</u>	<u>548</u>	<u>578</u>	377	367	161	57.3	261	48.4	26.1	286	303	184	21.3
Organochlorine Pesticides (μg/l	(g)																
2,4'-DDD	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
2,4'-DDE	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
2,4'-DDT	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
4,4'-DDD	2		<u>20</u>	<u>1000</u>	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
4,4'-DDE	2.2		<u>27</u>	<u>1000</u>	<u>33</u>	<u>29</u>	12		8.1	1.8	10	18	<1.2	<u>46</u>	<u>100</u>	<u>34</u>	3.2
4,4'-DDT	1		<u>7</u>	<u>1000</u>	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Total DDTs	1.58		<u>46.1</u>	<u>1000</u>	33	29	12		8.1	1.8	10	18	0	46	<u>100</u>	34	3.2
Aldrin	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Alpha-BHC	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Beta-BHC	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Chlordane	0.5		<u>6</u>	<u>2500</u>	<u><20</u>	<u><14</u>	<u><15</u>		<u><13</u>	<u><12</u>	<u><13</u>	<u><12</u>	<u><12</u>	<u><15</u>	<u><14</u>	<u><12</u>	<u><12</u>
Delta-BHC	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Dieldrin	0.02		<u>8</u>	<u>8000</u>	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endosulfan I	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endosulfan II	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endosulfan Sulfate	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endrin	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endrin Aldehyde	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Endrin Ketone	-		-	-	<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Gamma-BHC	-		-	-	<2.0 <2.0	<1.4 <1.4	<1.5 <1.5		<1.3 <1.3	<1.2 <1.2	<1.3 <1.3	<1.2 <1.2	<1.2 <1.2	<1.5 <1.5	<1.4 <1.4	<1.2 <1.2	<1.2 <1.2
Heptachlor Heptachlor Epoxide				-	<2.0	<1.4	<1.5	•	<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Methoxychlor	-		-		<2.0	<1.4	<1.5		<1.3	<1.2	<1.3	<1.2	<1.2	<1.5	<1.4	<1.2	<1.2
Toxaphene	+ :		-	-	<2.0 <40	<29	<31		<27	<25	<26	<24	<25	<29	<28	<25	<24
'			-		\4 0	\23	<u> </u>	•	\Z1	\ 20	\	\ 24	\20	\ 23	\ 20	\20	\24
Organotins (µg/kg)							1 .		I .		l		I	l		T -	
Dibutyltin	-		-	-	12	<4.3	<4.5		<4.0	6.5	8.5	<3.6	<3.7	10	11	<3.7	
Monobutyltin	-		-	-	<6.0	<4.3	<4.5		<4.0	<3.8	<3.9	<3.6	<3.7	<4.4	<4.2	<3.7	
Tetrabutyltin	-	I I	-	-	<6.0	<4.3	<4.5		<4.0	<3.8	<3.9	<3.6	<3.7	<4.4	<4.2	<3.7	

Table 8. Continued

							Parcel 6					Pare	cel 6		
		LBNS			Phase I	Phase I	Phase II	Phase I	Phase I	Phase II	Phase III	Phase I	Phase I	Phase II	Phase III
Analyte	ERL	(Copper	ERM	TTLC	SWM63	SWM63	SWM63	SWM64	SWM64	SWM64	SWM64	SWM65	SWM65	SWM65	SWM65
		only)			0-2 ft	4-6 ft	6-8 ft	0-2 ft	4-6 ft	6-8 ft	10-12 ft	0-2 ft	4-6 ft	6-8 ft	8-10 ft
Grain Size (%)	•	•		•	-	•	•	•		•	•	•	•		
Gravel	_		-	-	1.75	2.01	0.48	3.90	3.25	3.50	13.56	4.62	1.81	3.45	3.83
Sand	_			-	91.47	81.73	90.83	45.33	40.29	26.24	27.07	24.25	60.45	76.37	65.13
Silt			_	_	2.39	8.94	3.94	26.96	26.53	32.93	27.25	36.51	21.54	10.38	17.00
Clay	+			_	4.38	†	4.75	23.80	29.93			34.62	16.19		+
General Chemistry			-		4.36	7.33	4.75	23.80	29.93	37.33	32.11	34.02	16.19	9.80	14.03
,	1			I		1	I I	T		T		T			т
TOC (%)			-	-	0.19	0.66	0.05	1.86	3.83	4.09	3.43	2.88	1.34	0.98	1.44
Metals (mg/kg)								_							
Arsenic	8.2		<u>70</u>	<u>500</u>	4.13	11.8	2.4	16.9	<u>83.8</u>	33.9	46.7	26.7	18	16	27
Cadmium	1.2		<u>9.6</u>	<u>100</u>	0.16	0.53	<0.120	1.02	2.26	2.09	4.64	1.11	1.4	0.859	1.19
Chromium	81		<u>370</u>	<u>2500</u>	19.1	43.5	7.07	83.8	92.8	79.4	194	101	103	70.8	82.1
Copper	34	254	<u>270</u>	<u>2500</u>	62.2	253	12.7	<u>437</u>	<u>1670</u>	<u>829</u>	<u>1650</u>	<u>515</u>	<u>676</u>	<u>599</u>	<u>1170</u>
Lead	46.7		<u>218</u>	<u>1000</u>	87.4	205	9.2	212	<u>1040</u>	<u>507</u>	<u>935</u>	<u>231</u>	<u>256</u>	<u>237</u>	<u>266</u>
Mercury	0.15		<u>0.71</u>	<u>20</u>	0.47	<u>2.99</u>	0.101	<u>14.2</u>	<u>99.9</u>	<u>0.803</u>	<u>384</u>	<u>7.63</u>	<u>15.2</u>	<u>0.793</u>	<u>5.43</u>
Nickel	20.9		<u>51.6</u>	<u>2000</u>	13.8	14.6	4.12	31.5	49.6	50.6	51.3	38.1	27.7	22	23.1
Silver	1		<u>3.7</u>	<u>500</u>	<0.127	0.24	<0.120	0.46	0.54	0.71	0.879	0.62	0.51	0.195	0.533
Zinc	150		<u>410</u>	<u>5000</u>	107	<u>711</u>	50.6	<u>432</u>	<u>1320</u>	<u>823</u>	<u>2200</u>	<u>607</u>	<u>968</u>	<u>432</u>	<u>566</u>
Organochlorine Pesticides (μg/kg	g)														
2,4'-DDD	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
2,4'-DDE	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
2,4'-DDT	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
4,4'-DDD	2		20	1000	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	3	<1.5
4,4'-DDE	2.2		<u>27</u>	1000	8	19	1.9	31	41	13		21	120	30	140
4,4'-DDT	1		7	1000	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Total DDTs	1.58		46.1	1000	8	19	1.9	31	41	13		21	<u>120</u>	33	<u>140</u>
Aldrin	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Alpha-BHC	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Beta-BHC	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Chlordane	0.5		<u>6</u>	<u>2500</u>	<u><13</u>	<u><13</u>	<u><12</u>	<u><17</u>	<u><17</u>	<u><18</u>		<u><21</u>	<u><15</u>	<u><14</u>	<u><15</u>
Delta-BHC	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Dieldrin	0.02		<u>8</u>	<u>8000</u>	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Endosulfan I	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Endosulfan II	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Endosulfan Sulfate	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Endrin	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Endrin Aldehyde	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		8	<1.5	<1.4	<1.5
Endrin Ketone	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Gamma-BHC	-		-		<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Heptachlor	-		-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Heptachlor Epoxide	-	ļ	-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Methoxychlor	-	<u> </u>	-	-	<1.3	<1.3	<1.2	<1.7	<1.7	<1.8		<2.1	<1.5	<1.4	<1.5
Toxaphene	-		-	-	<25	<26	<24	<33	<34	<37		<43	<29	<28	<30
Organotins (µg/kg)															
Dibutyltin	-		-	-	10	80	<3.5	24	<5.1	<5.5		30	19	<4.2	
Monobutyltin	-		-	-	<3.8	<3.9	<3.5	<5.0	<5.1	<5.5		<6.4	<4.4	<4.2	
Tetrabutyltin	-		-	-	<3.8	<3.9	<3.5	<5.0	<5.1	<5.5		<6.4	<4.4	<4.2	
Tributyltin	-		-	-	55	300	11	190	<5.1	<5.5		340	140	33	

All values in dry weight except where noted

BOLD The measured concentration exceeds the analyte's respective ER-L value.

<u>BOLD, Underlined, and Yellow</u> The measured concentration exceeds the analyte's respective ER-M value.

<u>**BOLD**</u> and <u>**Underlined**</u> and <u>**Green**</u> The measured concentration exceedes the analyte's respective TTLC.

< = Below the method detection limit indicated.

E = Analyte detected at a concentration below the reporting limit and above the method detection limit. Value is estimated.

B = Analyte detected in procedural blank

Table 9. Summary of Exceedances of Sediment Quality Guidelines or Regulatory Levels in Sediment Collected within Parcel 4 in January 2007

		Within Par	cel 4										
56 Depth Intervals Analyzed across 20 Stations													
Metals	Range (mg/kg)	# < ER-L	ER-L < # < ER-M	ER-M<#< TTLC	TTLC < #								
Arsenic	2.01 – 170	27	27	2	0								
Cadmium	ND - 6.91	43	13	0	0								
Chromium	5.26 – 476	38	17	1	0								
Copper	3.60 - 3,490	12	20	23	1								
Lead	1.70 – 720	29	14	13	0								
Mercury	ND - 9.34	15	20	21	0								
Nickel	3.60 – 46.3	39	17	0	0								
Silver	ND - 0.94	56	0	0	0								
Zinc	15.9 – 5,150	24	12	19	1								

Organochlorine Pesticides

4,4'-DDD, 4,4'-DDE and 4,4'-DDT were the only DDT derivatives and organochlorine pesticides measured in sediments at stations within Parcel 4. 4,4'-DDD was detected at seven stations and exceeded its ER-M value (20 μ g/kg) at four of these stations with a maximum concentration of 62 μ g/kg at SWM36/4-6 ft. 4,4'-DDE was detected at all but one station (SWM07) and exceeded its ER-M value (27 μ g/kg) at 15 stations with a maximum concentration of 230 μ g/kg at SWM39/4-6 ft. 4,4'-DDT was only detected at three stations and exceeded its ER-M value (7 μ g/kg) at two stations with a maximum concentration of 19 μ g/kg at SWM31/4-6 ft. Total DDTs also exceeded its ER-M value (46.1 μ g/kg) at 13 locations.

Organotins

TBT was detected at every station and nearly every depth interval with concentrations ranging from non-detect to 4,200 μ g/kg. TBT exceeded concentrations of 100 μ g/kg value at 13 stations of the 20 stations within Parcel 4. Dibutyltin (DBT) was detected at multiple depth intervals at all stations within Parcel 4, except two (SWM03 and SWM07) which did not have any detections of DBT. DBT ranged in concentration from non-detect to 1,200 μ g/kg. Monobutyltin (MBT) was detected at nine stations, typically at only one depth interval. MBT ranged in concentration from non-detect to 110 μ g/kg. Tetrabutyltin (TTBT) was detected at nine stations. TTBT ranged in concentration from non-detect to 32 μ g/kg.

3.2.1.2 Offshore of Parcel 4

Four stations (SWM41 – SWM44) were located offshore of Parcel 4. Phase I (depth layers 0-2 ft and 4-6 ft) analysis was conducted on all 4 stations. In addition, one of the stations was analyzed as part of Phase IIa (depth layer 2-4 ft) and one of the stations was analyzed as part of Phase IIb (depth layer 6-8 ft) and Phase III (depth layer 8-10 ft).

Grain Size and TOC

At each station offshore of Parcel 4, the sediment in each depth interval primarily consisted of coarse-grained material, ranging from 54.3% to 97.4 % gravelly sands. TOC ranged in concentration from 0.03% at multiple stations to 1.10% at SWM42/0-2 ft.

Metals

At SWM42 and SWM44, copper, lead and mercury were detected at levels greater than ER-M values in surface and intermediate layer sediments and zinc was detected above its TTLC at SWM44/4-6 ft. However, these metals were below the ER-L values in the 4-6 ft depth interval at SWM42 and in the 8-10 ft depth interval at SWM44. The greatest concentrations of these metals occurred in the 4-6 ft depth interval at SWM44; copper had a maximum concentration of 422 mg/kg, lead was 854 mg/kg, mercury was 16 mg/kg and zinc was measured at 6,890 mg/kg. A summary of the frequency of stations exceeding sediment quality guidelines and TTLCs is provided in Table 10.

Table 10. Summary of Exceedances of Sediment Quality Guidelines or Regulatory Levels in Sediment Collected Offshore of Parcel 4 in January 2007

		Offshore of P	arcel 4											
	11 Depth Intervals Analyzed across 4 Stations													
Metals	Range (mg/kg)	# < ER-L	ER-L < # < ER-M	ER-M<#< TTLC	TTLC < #									
Arsenic	2.11 – 13.5	7	4	0	0									
Cadmium	ND – 2.76	10	1	0	0									
Chromium	4.63 – 151	8	3	0	0									
Copper	4.14 – 422	6	1	4 ¹	0									
Lead	1.68 – 854	6	1	4	0									
Mercury	ND – 16	6	1	4	0									
Nickel	3.94 – 22.4	10	1	0	0									
Silver	ND - 0.31	11	0	0	0									
Zinc	14.6 – 6,890	6	3	1	1									

¹ Includes 1 sample with a concentration greater than the LBNS copper threshold value of 254 mg/kg but less than the ER-M value of 270 mg/kg

Organochlorine Pesticides

The only DDT derivative and organochlorine pesticide measured in sediments at two stations (SWM42 and SWM43) offshore of Parcel 4 was 4,4'-DDE. 4,4'-DDE exceeded its ER-M value (27 μ g/kg) in the surface sediments at one station (SWM42) with a maximum concentration of 96 μ g/kg in the 0-2 ft depth interval. Total DDTs also exceeded its ER-M value (46.1 μ g/kg) at this location, and was directly attributable to the 4,4'-DDE concentration at that interval.

Organotins

TBT was measured above a concentration of 100 μ g/kg at both SWM42 and SWM44. At SWM42, the maximum concentration of 620 μ g/kg only occurred in the surface layer. At SWM44, elevated TBT concentrations ranged from 420 μ g/kg in the surface layer to 240 μ g/kg in the 4-6 ft depth interval. DBT was detected at stations SWM42 and SWM44; concentrations ranged form non-detect at SWM42/4-6 ft to 110 μ g/kg at SWM42/0-2 ft and SWM44/4-6 ft. MBT was detected only at station SWM44, with concentrations ranging from 11 μ g/kg at 6-8 ft to 29 μ g/kg at 0-2 ft. TTBT was not detected at any stations.

3.2.1.3 Adjacent to Parcel 5

Fifteen stations (SWM45 – SWM59) were located adjacent to Parcel 5. Phase I (depth layers 0-2 ft and 4-6 ft) analysis was conducted on all 15 stations. At four stations (SWM47, SWM55, SWM58 and SWM59), Phase II and Phase III analyses were not required. At seven stations (SWM45, SWM46, SWM52, SWM54, SWM56 and SWM57), Phase IIa (depth layer 2-4 ft) analyses were conducted and at four stations (SWM49, SWM50, SWM51 and SWM53), Phase IIb (depth layer 6-8 ft)

analyses were conducted. The 6-8 ft depth interval at SWM57 was also analyzed in Phase III to further delineate elevated levels of TBT.

Grain Size and TOC

All depth intervals at all stations adjacent to Parcel 5, except SWM45/2-4 ft and SWM58/0-2 ft, consisted of predominantly coarse-grained material (ranging from 54.4% to 98.2% gravelly sand). Fine-grained material was predominant at SWM45/2-4 ft (58.1% silts and clays) and at SWM58/0-2 ft (79.9% silts and clays). TOC ranged from 0.02% at SWM54/4-6 ft to 3.15% at SWM46/0-2 ft.

Metals

At five stations (SWM45, SWM46, SWM48, SWM54, and SWM57) metals concentrations were generally low throughout the sediment column with only an occasional ER-M exceedance of one metal at multiple depth intervals or a few metals at one depth interval. At SWM45, SWM46 and SWM48, mercury was the only metal to exceed ER-M values in the surface and, at two sites (SWM46 and SWM48), in the 2-4 ft depth interval. Lead and mercury concentrations were greater than ER-M values in the surface sediments at SWM54 and SWM57, with the highest concentrations of lead (293 mg/kg) and mercury (15.2 mg/kg) at SWM57/0-2 ft.. Zinc was also greater than its ER-M value in the surface sediments at SWM54, with a concentration of 459 mg/kg.

At five stations (SWM49 – SWM53), several metals, including copper, lead, mercury and zinc, exceeded ER-M values at multiple depth intervals at each station. At SWM56, mercury exceeded its TTLC. The maximum level of copper occurred in the SWM50/6-8 ft depth interval with a concentration of 722 mg/kg and a corresponding concentration of 849 mg/kg in the duplicate sample taken at that station. Both lead and zinc exceeded their TTLCs (1,000 mg/kg and 5,000 mg/kg, respectively) in the SWM52/2-4 ft sample with concentrations of 3,080 mg/kg and 6,060 mg/kg, respectively. Mercury was the only metal to exceed ER-M or TTLC guidelines at SWM56, with a concentration of 23.6 mg/kg in the surface sediments, greater than its TTLC of 20 mg/kg. In one sample, SWM51/4-6 ft, chromium also exceeded its ER-M value (370 mg/kg) with a concentration of 830 mg/kg; however, chromium was also detected in the associated procedural blank for this sample. A summary of the frequency of stations exceeding sediment quality guidelines and TTLCs is provided in Table 11.

Table 11. Summary of Exceedances of Sediment Quality Guidelines or Regulatory Levels in Sediment Collected Adjacent to Parcel 5 in January 2007

		Adjacent to F	Parcel 5											
	44 Depth Intervals Analyzed across 15 Stations													
Metals	Range (mg/kg)	# < ER-L	ER-L < # < ER-M	ER-M<#< TTLC	TTLC < #									
Arsenic	1.35 – 17.4	30	14	0	0									
Cadmium	ND - 3.45	42	2	0	0									
Chromium	3.45 - 830	34	9	1	0									
Copper	3 - 722	15	25	4	0									
Lead	1.26 - 3,080	22	10	11	1									
Mercury	ND - 23.6	10	19	14	1									
Nickel	3.36 – 43.7	32	12	0	0									
Silver	ND – 1.27	43	1	0	0									
Zinc	17.8 – 6,060	24	11	8	1									

Organochlorine Pesticides

The only DDT derivative and organochlorine pesticide measured in sediments from nearly all depth intervals and at all stations adjacent to Parcel 5 was 4,4'-DDE. 4,4'-DDE exceeded its ER-M value (27)

 $\mu g/kg$) at six stations (SWM50 – SWM54 and SWM56) with a maximum concentration of 300 $\mu g/kg$ in the 0-2 ft depth interval at SWM54. Total DDTs also exceeded its ER-M value (46.1 $\mu g/kg$) at each of these stations, except SWM53, and was directly attributable to the 4,4'-DDE concentration at those intervals.

Organotins

TBT was greater than a concentration of $100 \,\mu g/kg$ at six stations adjacent to Parcel 5 (SWM50, SWM52, SWM53, and SWM57 – SWM59). At three of these stations (SWM52, SWM58 and SWM59), TBT only exceeded $100 \,\mu g/kg$ in the surface sediments, with a maximum concentration of $1600 \,\mu g/kg$ at SWM52/0-2 ft. At SWM50 and SWM53, TBT only exceeded $100 \,\mu g/kg$ in the 4-6 ft depth interval. At SWM57, TBT was detected above $100 \,\mu g/kg$ in the surface sediments and in the 4-6 ft depth interval. DBT was detected in at least one depth interval at 13 of the 15 stations; concentrations were below $100 \,\mu g/kg$ in all samples except SWM52/0-2 ft ($230 \,\mu g/kg$) and SWM57/0-2 ft ($120 \,\mu g/kg$). MBT and TBT were only detected in a few samples and demonstrated concentrations below $24 \,\mu g/kg$.

3.2.1.4 Adjacent to Parcel 6

Seven stations (SWM40, SWM60 – SWM65) were located adjacent to Parcel 6. Phase I (depth layers 0-2 ft and 4-6 ft) analysis was conducted on all seven stations. At SWM60, Phase II and Phase III analyses were not required. One of the stations (SWM61) was analyzed as part of Phase IIa (depth layer 2-4 ft), and stations SWM40 and SWM62-65 were analyzed as part of Phase IIb (depth layer 6-8 ft). Stations SWM40, SWM62, SWM64, and SWM65 were analyzed as part of Phase III (depth layer 8-10 ft).

Grain Size and TOC

All depth intervals at all stations adjacent to Parcel 6, except SWM64 (all depths) and SWM65 (0-2 ft), consisted of predominantly coarse-grained material (ranging from 55.0% to 97.9% gravelly sand). Each depth interval at SWM64 and the surface sediment at SWM65 consisted of predominantly fine-grained material (ranging from 50.8% to 71.13% silts and clays). TOC ranged from 0.03% at SWM62/8-10 ft to 4.09% at SWM64/6-8 ft, corresponding with areas of coarse-grained and fine-grained material, respectively.

Metals

At three stations (SWM60, SWM61, and SWM63) metals concentrations were generally low throughout the sediment column with only an occasional ER-M exceedance of one or two metals in one depth interval. In contrast, at four stations (SWM40, SWM62, SWM64 and SWM65), several metals exceeded ER-Ms or TTLCs at multiple depth intervals. Specifically, at SWM60, none of the metals exceeded ER-M values. At SWM61 lead exceeded its ER-M value in the surface sediment with a concentration of 251 mg/kg. At SWM63, mercury and zinc exceeded their ER-M values only in the 4-6 ft depth interval with concentrations of 2.99 mg/kg and 711 mg/kg, respectively.

At SWM40, SWM62, SWM64 and SWM65, the concentration of most metals, with the notable exception of silver, exceeded ER-L values, with several metals (copper, lead, mercury and zinc) consistently exceeding ER-M values from the surface to the deepest depth interval analyzed. However, copper, mercury, and zinc, were below ER-L values in the deepest depth interval (8-10 ft) at SWM62. Of these four stations, SWM64 had the highest overall contaminant levels. Arsenic was greater than its ER-M (70 mg/kg) in the 4-6 ft depth interval with a concentration of 83.8 mg/kg; arsenic exceeded the ER-L at all other depth intervals. Copper exceeded the CSTF target cleanup level (261 mg/kg) and the ER-M value (270 mg/kg) at all depth intervals with a maximum concentration of 1,670 mg/kg in the 4-6 ft depth interval. The maximum concentration of lead occurred in the 4-6 ft depth interval with a value of 1,040 mg/kg, greater than its TTLC of 1,000 mg/kg. Mercury exceeded its TTLC (20 mg/kg) at two depth intervals, with a concentration of 99.9 mg/kg in the 4-6 ft depth interval and a maximum concentration of 384 mg/kg in the 10-12 ft depth interval. Zinc had a maximum concentration in the 10-12 ft depth interval with a value of 2,200 mg/kg. It should be noted that mercury also exceeded its TTLC in the 4-6 ft depth

interval at SWM40. A summary of the frequency of stations exceeding sediment quality guidelines and TTLCs is provided in Table 12.

Table 12. Summary of Exceedances of Sediment Quality Guidelines or Regulatory Levels in Sediment Collected Adjacent to Parcel 6 in January 2007

		Adjacent to P	arcel 6										
24 Depth Intervals Analyzed across 7 Stations													
Metals	Range (mg/kg)	# < ER-L	ER-L < # < ER-M	ER-M<#< TTLC	TTLC < #								
Arsenic	1.61 – 83.8	9	14	1	0								
Cadmium	ND - 4.64	19	5	0	0								
Chromium	4.93 – 194	9	15	0	0								
Copper	5.67 – 1,670	4	8	12	0								
Lead	2.5 – 1,040	4	6	13	1								
Mercury	0.07 – 384	5	5	11	3								
Nickel	4.12 – 76.7	11	12	1	0								
Silver	ND - 0.879	24	0	0	0								
Zinc	21.3 – 2,200	6	7	11	0								

Organochlorine Pesticides

The only DDT derivative and organochlorine pesticide measured in sediments from nearly all depth intervals and at all stations adjacent to Parcel 6 was 4,4'-DDE; however, 4,4'-DDD was detected at one depth interval at one station (SWM65/6-8 ft), but was below its ER-M value of 20 μ g/kg. 4,4'-DDE exceeded its ER-M value (27 μ g/kg) at four stations (SWM40, SWM62, SWM64 and SWM65) with a maximum concentration of 140 μ g/kg in the 8-10 ft depth interval at SWM65. Total DDTs also exceeded its ER-M value (46.1 μ g/kg) at SWM62/4-6 ft, SWM65/4-6 ft and SWM65/8-10 ft, directly attributable to the 4,4'-DDE concentration a those intervals.

Organotins

TBT was greater than 100 μ g/kg at five of the seven stations adjacent to Parcel 6 (SWM40, SWM62, SWM63, SWM64 and SWM65). At three of these stations (SWM40, SWM64 and SWM65), TBT exceeded 100 μ g/kg in surface sediments, with a maximum concentration of 340 μ g/kg at SWM65/0-2 ft. At SWM62 and SWM63, TBT did not exceed 100 μ g/kg in the surface sediments but exceeded this concentration in the 4-6 ft depth interval, with concentrations of 200 μ g/kg, and 300 μ g/kg, respectively. DBT was detected at least one depth interval at all stations adjacent to Parcel 6; however, concentrations were low and ranged from non-detect in many depth intervals to 80 μ g/kg in SWM63/4-6 ft. MBT and TTBT were not detected at any stations.

3.3 Quality Control Results

3.3.1 Physical Analyses

All physical analyses met QA/QC criteria specified by ASTM or USEPA guidelines for the measurement of grain size and TOC.

3.3.2 Chemical Analyses

Method reporting limits (MRLs) for target analytes were greater than or equal to method detection limits (MDLs) and above instrument detection limits as described by USEPA SW-846 protocol. MDLs are listed in Weston's SAP (Weston, 2007).

3.3.2.1 Phase I

All chemical analyses met QA/QC criteria with only a few exceptions. Laboratory contamination was controlled through the analysis of procedural blanks on a minimum frequency of 1 per batch. All analytes in the procedural blanks were below reporting limits with the exception of chromium and lead. Chromium in the procedural blanks ranged from non-detect (in three batches) to 0.179 mg/kg; the reporting limit for chromium was 0.100 mg/kg. Lead was detected in one procedural blank sample with a concentration of 0.242 mg/kg; the reporting limit for lead was 0.100 mg/kg. There were a total of 6 separate batches of Phase I samples.

Accuracy of the project data was indicated by analysis of matrix spikes, surrogate spikes, and/or laboratory control samples on a minimum frequency of one per batch. Copper, lead, nickel and zinc had matrix spike recoveries outside control limits in one or more batches. Endrin aldehyde, 4,4'-DDE, and 4,4'-DDT had matrix spike recoveries outside control limits in one or more batches; however, in one batch, the matrix spike recoveries for nearly all the organochlorine pesticides were greater than the control limits. Tributyltin and tetrabutyltin had matrix spike recoveries outside control limits in one or more batches. In all cases, though, the associated laboratory control sample was in control; therefore, the sample data was reported without further clarification. Surrogate recoveries and laboratory control samples were all within acceptable control limits.

Precision of the project data was determined by analysis of duplicate matrix spikes, blank spikes, and/or duplicate test sample analysis on a minimum frequency of one per batch. Copper and zinc had matrix spike recoveries outside control limits in one or more batches. Copper, lead, nickel and zinc also had relative percent difference (RPD) values greater than control limits in one or more batches. Endosulfan II was the only pesticide not to have either a matrix spike recovery or RPD value outside control limits; the remaining pesticide's precision data exceeded control limits in one or more batches. Tributyltin and tetrabutyltin matrix spike recoveries exceeded control limits in four batches, and the RPD for tributyltin was greater than control limits in only one batch. In all cases, though, the associated laboratory control sample duplicate or post-digestion spike duplicate recoveries were in control suggesting matrix interference. The data were reported without further clarification. All laboratory control sample duplicate and post-digestion spike recoveries were in control.

Based on QA/QC results, the actual detectable concentrations of chromium and lead in sediment samples analyzed during Phase I, should be interpreted with caution, especially for samples demonstrating low concentrations of these trace metals.

3.3.2.2 Phase II

All chemical analyses met QA/QC criteria. Laboratory contamination was controlled through the analysis of procedural blanks on a minimum frequency of 1 per batch. All analytes in the procedural blanks were below reporting limits. There were a total of three separate batches of Phase II samples.

Accuracy of the project data was indicated by analysis of matrix spikes, surrogate spikes, and/or laboratory control samples on a minimum frequency of one per batch. Copper and zinc had matrix spike recoveries outside control limits in one or more batches. Several organochlorine pesticides including endrin aldehyde, endosulfans, heptachlor, methoxychlor, 4,4'-DDD, and 4,4'-DDT had matrix spike recoveries outside control limits in one or more batches. In all cases, however, the associated laboratory control sample was in control; therefore, the sample data was reported without further clarification. Surrogate recoveries and laboratory control samples were all within acceptable control limits.

Precision of the project data was determined by analysis of duplicate matrix spikes, blank spikes, and/or duplicate test sample analysis on a minimum frequency of one per batch. Matrix spike recoveries and RPD values met control limits for all analyses.

3.3.2.3 Phase III

All chemical analyses met QA/QC criteria. Laboratory contamination was controlled through the analysis of procedural blanks on a minimum frequency of 1 per batch. All analytes in the procedural blanks were below reporting limits. There was only one batch of Phase III samples.

Accuracy of the project data was indicated by analysis of matrix spikes, surrogate spikes, and/or laboratory control samples on a minimum frequency of one per batch. Precision of the project data was determined by analysis of duplicate matrix spikes, blank spikes, and/or duplicate test sample analysis on a minimum frequency of one per batch. Matrix spike recoveries and RPD values also met control limits for all analytes. Surrogate recoveries and laboratory control samples were all within acceptable control limits.

4.0 CONCLUSIONS

4.1 Within Parcel 4

Most sediment samples (75%) collected within Parcel 4 consisted of primarily coarse-grained material, ranging from 52.1% to 98.2% gravelly sand. TOC ranged in concentration from 0.03% at multiple stations to 4.2% at SWM31/0-2 ft. Stations within Parcel 4 demonstrating the highest concentrations of contaminants were those found at stations located under the former dry docks or along the wharves (i.e. SWM03, SWM10, SWM13, SWM25, SWM28, SWM30 – SWM33, SWM36, SWM38 and SWM39). In these areas, there were multiple metals exceeding ER-M values in a single depth layer and nine stations or at several depth layers. Copper, mercury, and zinc exceeded ER-M values in at least 19 of the 56 samples analyzed. Moreover, at SWM13, copper and zinc both exceeded their TTLCs (2,500 mg/kg and 5,000 mg/kg, respectively) with concentrations of maximum observed concentrations of 3,490 mg/kg and 5,150 mg/kg, respectively. The only organochlorine pesticides detected were DDT or its derivatives, with 4,4'-DDE exceeding its ER-M value at 15 of the 27 stations. The maximum value of 4,4'-DDE measured was 230 μg/kg at SWM39/4-6 ft. TBT and other organotins were also detected throughout the Parcel 4 area with 13 of the 27 stations demonstrating TBT concentrations above 100 μg/kg, and the maximum value of 4,200 μg/kg detected at SWM32/0-2 ft.

4.2 Offshore of Parcel 4

Sediment samples collected offshore of Parcel 4 consisted of primarily coarse-grained material, ranging from 54.3% to 97.4% gravelly sands. TOC ranged in concentration from 0.03% at multiple stations to 1.10% at SWM42/0-2 ft. Stations offshore of Parcel 4 demonstrating the highest concentrations of contaminants were those found closest to Parcel 4 (SWM42 and SWM44). At these stations, there were multiple metals (copper, lead, mercury, and zinc) that exceeded ER-M values, and at one depth interval (SWM44/4-6 ft) zinc exceeded its TTLC of 5,000 mg/kg, with a concentration of 6,890 mg/kg. The only organochlorine pesticide detected was the DDT derivative, 4,4'-DDE, which only exceeded its ER-M value at one station in this area (SWM42), with a concentration of 96 µg/kg. SWM42 and SWM44 also demonstrated elevated levels of TBT that exceeded 100 µg/kg in at least one of the top depth intervals, demonstrating a maximum concentration of 620 µg/kg at SWM42/0-2 ft.

4.3 Adjacent to Parcel 5

With the exception of two depth intervals, sediment samples collected adjacent to Parcel 5 consisted of primarily coarse-grained material, ranging from 54.4% to 98.2% gravelly sands. TOC ranged from 0.02% at SWM54/4-6 ft to 3.15% at SWM46/0-2 ft. Stations adjacent to Parcel 5 demonstrating the highest concentrations of contaminants included SWM49 – SWM53. In this area, there were multiple metals (copper, lead, mercury, and zinc) that exceeded ER-M values at multiple depths. At a few depth intervals, there were TTLC exceedances for lead (3,080 mg/kg), mercury (23.6 mg/kg), and zinc (6,060 mg/kg) at stations SWM52/2-4 ft, SWM56/0-2 ft, and SWM52/2-4 ft, respectively. The only organochlorine pesticide detected was the DDT derivative, 4,4'-DDE, which exceeded its ER-M at six of the 15 stations in this area, with a maximum concentration of 300 μg/kg at SWM54/0-2 ft. TBT and other organotins were also detected adjacent to Parcel 5 with six stations demonstrating TBT concentrations above 100 μg/kg, and the maximum value of 1,600 μg/kg detected at SWM52/0-2 ft.

4.4 Adjacent to Parcel 6

With the exception of two stations (SWM64 and SWM65), sediment samples collected adjacent to Parcel 6 consisted of primarily coarse-grained material, ranging from 55% - 98.3% gravelly sands. TOC ranged from 0.03% at SWM62/8-10 ft to 4.09% at SWM64/6-8 ft, corresponding with areas of coarse-grained and fine-grained material, respectively. At four of the seven stations in this area, (SWM40, SWM62, SWM64 and SWM65), the concentration several metals (copper, lead, mercury and zinc) consistently exceeded ER-M values in the surface and multiple depth intervals. In addition, several depth intervals demonstrated TTLC exceedances for mercury and lead, with concentrations of 22.5 – 384 mg/kg and 1040 mg/kg, respectively. The only organochlorine pesticides detected were the DDT derivatives, 4,4'-DDD and 4,4'-DDE. 4,4'-DDE exceeded its ER-M value at four stations in this area (SWM40, SWM62, SWM64, and SWM65), with a maximum concentration of 140 μg/kg (SWM65/8-10 ft). TBT was elevated above 100 μg/kg at five of seven stations in this area, demonstrating a maximum concentration of 340 μg/kg at SWM65/0-2 ft.

5.0 REFERENCES

- American Society for Testing and Materials (ASTM). 2005. D4318-05 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils. *Annual Book of Standards, Soil and Rock (I), Vol. 04.08*, West Conshohocken, PA.
- Department of Defense (DoD). 2006. Quality Systems Manual for Environmental Laboratories.

 Department of Defense Environmental Data Quality Workgroup, Department of Navy, Washington, DC.
- Krone, C.A., D.W. Brown, D.G. Burrows, R.G. Bogar, S.-L. Chan, and U. Varanasi. 1989. A method for analysis of butyltin species and measurement of butyltins in sediments and English Sole livers from Puget Sound. *Marine Environmental Research*, 27:1-18.
- Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environmental Management*, 19:81-97.
- National Environmental Laboratory Accreditation Conference (NELAC). 2004. 2003 NELAC Standard. EPA/600/R4/003. Washington, DC.
- Plumb, R.H., Jr. 1981. Procedure for Handling and Chemical Analysis of Sediment and Water Samples. Technical Report EPA/CE-81-1. U.S. Army Waterways Experimental Station, Vicksburg, MS.
- United States Environmental Protection Agency (USEPA). 1983. Methods for Chemical Analysis of Water and Wastes. Revised. EPA/600/4/79/020. EPA Office of Research and Development, Environmental Monitoring and Support Laboratory, Cincinnati. March.
- United States Environmental Protection Agency Region II (USEPA Region II). 1988. Determination of Total Organic Carbon in Sediment (Lloyd Kahn Method). Edison, NJ. 27 July.
- United States Environmental Protection Agency and United States Army Corps of Engineers (USEPA/USACE). 1991. Evaluation of Dredged Material Proposed for Ocean Disposal: Testing Manual (Ocean Testing Manual). EPA 503/8-91/001. EPA Office of Water, Washington, DC. February.
- United States Environmental Protection Agency Region IX and United States Army Corps of Engineers Honolulu Engineer District (USEPA Region IX/USACE Honolulu District). 1997. Regional Implementation Manual (RIM). Requirements and Procedures for Evaluation of Dredged Material Proposed for Ocean Disposal in the State of Hawaii Draft. January.
- United States Environmental Protection Agency (USEPA). 2004. Standard Method 9060A Total Organic Carbon, SW-846. EPA Office of Solid Waste and Emergency Response, Washington, DC. November.
- Weston Solutions, Inc. (Weston). 2005. Final Report. Chemical and Geotechnical Characterization of Sediments in the Vicinity of Southwest Marine, Port of Los Angeles. December.
- Weston Solutions, Inc. (Weston). 2006. Draft Scoping of Remediation Plan for Southwest Marine Aquatic Leasehold Area: Preliminary Volume Estimates and Identification of Potential Management Alternatives. February.

Weston Solutions, Inc. (Weston). 2007a. Final Sampling and Analysis Plan. Chemical Characterization of Sediments within the Southwest Marine Leasehold Areas for Use in Remediation Efforts. January.

Weston Solutions, Inc. (Weston). 2007b. Southwest Marine Aquatic Leasehold Area: Volume Estimates for Remediation. Final Report. May.